Heating Piping & Air Conditioning

DESIGN
INSTALLATION
OPERATION
MAINTENANCE

OCTOBER ★ 1951

INDUSTRIAL
COMMERCIAL
INSTITUTIONAL AND
PUBLIC BUILDINGS

Page 125—Journal Section of The American Society of Heating and Ventilating Engineers

Big Cooling Tower for New Pittsburgh Shyscraper .... see page 95

Heating the Schools of Los Angeles . 112

Air Conditioned Kitchen . . . 106

Mechanical Seals for Pumps . . 102

Complete Contents of This Issue 5

PIPING MATERIALS FOR CHEMICAL PROCESSES . . . . PAGE 85

DOWNRIGHT

better performance

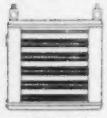
Vertical Delivery
THERMOLIER
Unit Heaters . . .

RIGHT DOWN

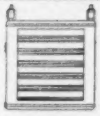
where maximum heat is desired...

4 MODELS . . . . . 18 SIZES

Vertical Delivery



Horizontal Delivery



Textile Model

Velocity Nozzle

A thermostatic trap, the simplest and least expensive of all traps, is practical because of Thermolier's exclusive cooling leg.

Maximum capacity assured, annoying destructive water hammer eliminated — by built-in pitch of tubes and internal cooling leg which assure continuous drainage of condensate.

Damaging strains caused by expansion and contraction eliminated by "U" type expansion tubes.

Safety and durability assured with leak-proof tube-to-header construction.

Five other important construction features. Write for Thermolier Catalog.

in warehouses, plants and other hard-to-heat buildings

HEATING COMFORT AND ECONOMY. Heat is forced down to the working level . . . not banked uselessly at the ceiling level. Thermoliers provide quick heating from a cold start. Desired room temperatures are easily maintained within a close range.

ADAPTABILITY TO EQUIPMENT AND FLOOR LAYOUT. The units and the simple piping are overhead where they do not interfere with arrangement of operating machinery or equipment and do not take up valuable floor or wall space. Units are easily relocated at any time to meet changes in plant layout or heating requirements.

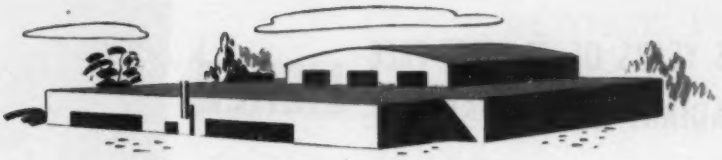
LOW FIRST COST. Thermoliers are so efficient and so compact that their heating capacity is often equivalent to the capacity of cast iron radiation or pipe coils of twice the cost.

GRINNELL

WHENEVER PIPING IS INVOLVED

Grinnell Company Inc., Providence 1, Rhode Island • Sales Offices and Warehouses in Principal Cities

pipe and tube fittings • welding fittings • engineered pipe hangers and supports • Thermolier unit heaters • valves Grinnell-Saunders diaphragm valves • pipe • prefabricated piping • plumbing and heating specialties • water works supplies industrial supplies • Grinnell automatic sprinkler fire protection systems • Amco humidification and cooling systems



If it's a

clear span building

and needs BETTER HEATING

Specify a

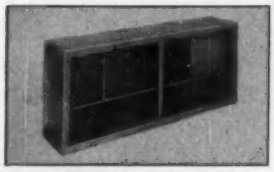
usAIRco BLOWER-TYPE UNIT HEATER

Where large industrial areas must be heated efficiently, at low cost, you can offer more heat per heating dollar with a usAIRco-built Blower Type Unit Heater.

Here are heaters that have the power to distribute warm air at high velocities throughout the zone to be heated. A single usAIRco Blower Type Unit Heater can replace many of the usual propeller type heaters and deliver more healthful, uniform warmth plus vastly improved circulation at substantially lower cost.

They have all-round adaptability for application in factories, warehouses, garages, hangars—industrial plants of all kinds. Units are built in eight sizes with arrangements for floor, ceiling, wall or inverted wall mounting. Capacities range from 37,500 to 1,995,000 Btu's per hour.

As with all usAIRco equipment, the heaters are outstanding for simplicity and soundness of engineering, fine workmanship, quiet operation, extreme flexibility and long life. For full details on construction features, write for Bulletin No. 73.



FILTER SECTIONS provide for filtering of air through a wide range of capacity at low filter velocity.

FACE AND BY-PASS DAMPER SECTION. Separate damper section is available for installation between blower and coil sections—external by-pass. Dampers can be manually or automatically controlled.

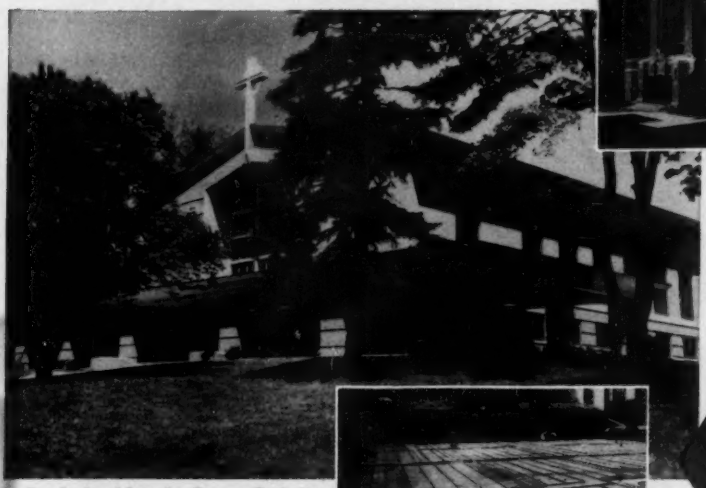
MIXING CHAMBERS are equipped with outside air and return air intakes. Dampers are provided for intake openings. Easy access to dampers is provided for through access doors in mixing chambers.

SECTIONAL ASSEMBLY. Standard units are furnished either with or without coil sections, face and by pass sections, filter sections and mixing chambers. Sectional assembly permits easy installation and maintenance.

UNITED STATES AIR CONDITIONING CORPORATION

3300 Como Avenue Southeast, Minneapolis 14, Minn.

23 YEARS OF TROUBLE-FREE RADIANT HEATING SERVICE HERE



SUPPORTS
BYERS WROUGHT IRON PIPE HERE

Our Lady of Lourdes Roman Catholic Church, Bethesda, Maryland

Schreier, Patterson & Worland—Architect
M. F. Hoppe—Consulting Engineer
Frank M. Dorsey & Sons, Inc.—Heating Contractor
F. H. Martell Co., Inc.—General Contractor
Noland Company—Fabricator

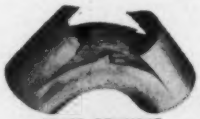
In the recently completed Our Lady of Lourdes Roman Catholic Church, the designers used a proven means of avoiding maintenance difficulties in the radiant heating system. They specified genuine wrought iron pipe for the service. More than 5 tons of Byers Wrought Iron pipe, fabricated into heating coils, was installed in the floor of the church and rectory.

The widespread use of genuine wrought iron pipe for radiant heating systems is supported by hundreds of successful installations. A typical example is the Sacred Heart Church in Pittsburgh, pictured above. Here, the radiant heating system, utilizing Byers Wrought Iron pipe, has given trouble-free service for the past 23 years, and is still going strong.

Byers Wrought Iron pipe has long been the first choice of experienced engineers for radiant heating systems because of its unusual combination of advantages. It is readily formed and welded which speeds and simplifies installation. It has a high rate of heat emission. It expands and contracts at practically identical rates with concrete. It has ample mechanical strength to withstand damage during installation. And its corrosion resistance has been demonstrated time and time again, over periods of many years.

Our bulletin, BYERS WROUGHT IRON FOR RADIANT HEATING, gives the complete story. Write for a copy.

A. M. Byers Company, Pittsburgh, Pa. Established 1864. Boston, New York, Philadelphia, Washington, Atlanta, Chicago, St. Louis, Houston, San Francisco. Export Division: New York, N. Y.



WHY GENUINE WROUGHT IRON LASTS

This notch-fracture test specimen illustrates the unique fibrous structure of genuine wrought iron—which is responsible for the high corrosion resistance of the material. Tiny threads of glass-like silicate slag, distributed through the body of high-purity iron, halt and disperse corrosive attack, and discourage pitting and penetration. They also anchor the initial protective scale, which shields the underlying metal.

BYERS

CORROSION COSTS YOU MORE THAN WROUGHT IRON

WROUGHT IRON

TUBULAR AND HOT ROLLED PRODUCTS

ELECTRIC FURNACE QUALITY ALLOY AND STAINLESS STEEL PRODUCTS

Heating Piping & Air Conditioning

Vol. 23, No. 10

(with which is merged the Aerologist)

DESIGN, INSTALLATION, OPERATION AND MAINTENANCE IN INDUSTRIAL, COMMERCIAL, INSTITUTIONAL AND PUBLIC BUILDINGS

BOARD OF CONSULTING AND CONTRIBUTING EDITORS . . . .

N. R. Bernz, Leo F. Collins, Sabin Crocker, R. C. Doremus, Philip Drinker, M. K. Fahnestock, Walter L. Fleisher, F. E. Giesecke, William Goodman, William A. Hanley, J. J. Harman, C. W. Hauck, R. S. Hawley, E. P. Heckel, R. E. Hieronymus, J. C. Hornung, Lee P. Hynes, C. W. Kimball, Dwight D. Kimball, A. C. Kirkwood, Charles S. Leopold, Samuel R. Lewis, H. C. Murphy, Alfred J. Offner, F. B. Rowley, Robert P. Schoenijahn, Kalman Steiner, T. S. Tenney, Rush D. Touton, Eph. A. Tyler, W. H. Wilson

EDITOR . . . . C. M. BURNAM, JR.

ASSOCIATE EDITOR . . . . THOMAS V. JOHNSON

ASSISTANT EDITOR . . . . AILEEN H. BURNS

ADVERTISING STAFF . . . .

Wallace J. Osborn, New York—Murray Hill 9-8293 . . . . Robert A. Jack, Cleveland—Yellowstone 2-1540 . . . . James D. Thomas and George C. Cutler, Chicago—State 2-6916 . . . . R. P. Wettstein, Los Angeles—Dunkirk 8-2286, Portland—Atwater 4107, San Francisco—Yukon 6-2522

PUBLISHER . . . . FRANK P. KEENEY

MANAGER . . . . CHARLES E. PRICE

CIRCULATION DIRECTOR . . . . FRANK S. EASTER

PRODUCTION MANAGER . . LAWRENCE A. DOYLE

Published monthly by the Keeney Publishing Co., 6 N. Michigan Ave., Chicago 2, Ill. Telephone: STate 2-6916. Subscriptions: U.S. and possessions, $3.00 per year; Canada, Cuba, Mexico, Central America, South America, $4.00 per year; other, $6.00. Current copies, U.S. and possessions, 35c each; back copies, 60c each. January 1951 issue, $1.50 per copy. For change of address, notify publisher and your local postoffice of both old and new addresses by the 15th of the preceding month. Member Audit Bureau of Circulations and Associated Business Publications, Inc. Heating, Piping & Air Conditioning is indexed regularly by Engineering Index, Inc.

Copyright 1951 by the Keeney Publishing Co.

Entered as Second Class Matter May 10, 1929, at the Post Office at Chicago, Ill., U.S.A., under the Act of March 3, 1879. Additional entry at Mendota, Ill.

OCTOBER 1951

Feature Articles

Piping Materials for Chemical Processes 85
Insulation Seals Windows of Air Conditioned Room 94
Two Air Conditioning Schemes Serve New Skyscraper 95
Issues Warning on Radioactive Wastes 97
Heat Pumps Do Double Jobs 98
"Spot Cooling" Solves Problem at 332 Welding Stations 100
Mechanical Seals for Centrifugal Process Pumps 102
Air Conditioning System for Cafeteria Kitchen 106
Piping Fuel, Conditioned Air, Other Services at Airport 108
Snow Melting Questions — and Answers 111
Heating Modernized at Old Church 111
Heating the Schools of Los Angeles 112

Regular Departments

The Editor's Pages 77
"Open for Discussion" 81
New Interpretations — Code for Pressure Piping 117
Sam Lewis' Page — Plaster and Radiant Heating 118
Data Sheet — Aluminum Pipe 119
Question of the Month 122
New Question — Paint Peels from Steel Stack 123
The Law and Your Profits — Trade Secrets 124
Equipment Developments 189
Who's What 200
New Books and Reports 212
Meetings and Conventions 216
Recent Trade Literature 220
Index to Advertisers 230

ASHVE Journal Section

Removal of Bacteria and Bacteriophage from Air 125
New Environment Laboratory To Be Inaugurated 130
Members Can Help Remove Panel Heating Restriction 131
St. Louis Planning 58th Annual Meeting 132
Nominations for 1952 134
Summary of Chapter Meetings 141
Candidates for Membership 144
Officers, Council and Committees 147

1. Superior Construction
Close-coupled construction with pump and motor on a single shaft assures accurate alignment and maximum rigidity to maintain that alignment. Bearing and seal life are prolonged. All units are equipped with high-grade mechanical seal which requires no maintenance and no adjustment when the pump is installed. Motors are of a well-known standard make which have passed thorough Allis-Chalmers tests for reliability. Ball bearings are of the sealed type, which means they will run for years without attention.

2. Easy Mounting in Any Position
The simple two-screw mounting bracket makes it easy to mount this pump in any position or location as long as the motor end of the shaft is horizontal or above. You save time, trouble and installation cost. The same basic pump design is also available in a vertical model specially designed for sidewall mounting in tanks and basins without special provisions. The discharge flange is simply bolted to the side of the tank.

3. Ample Engineering Assistance
A competent Allis-Chalmers pump application engineer with wide experience in applying air conditioning pumps will be glad to help you select exactly the pump you need for dependability at lowest cost. These qualified engineers can often suggest cost-saving changes in your installation. And they have a complete range of types and sizes to choose from. Next time you need help on your pumping problems, call the Allis-Chalmers Authorized Distributor or District Office near you. Or write Allis-Chalmers, Milwaukee 1, Wisconsin and ask for Bulletin 52B 7529. A-3520

Sold . . .
Applied . . .
Serviced . . .
by Allis-Chalmers Authorized Dealers, Certified Service Shops and Sales Offices throughout the country.

MOTORS — ½ to 25,000 hp and up. All types.

CONTROL — Manual, magnetic and combination starters; push button stations and components for complete control systems.

TEXROPE — Belts in all sizes and sections, standard and *Vari-Pitch* sheaves, speed changers.

Texrope and *Vari-Pitch* are Allis-Chalmers trademarks.

ALLIS-CHALMERS

PITTSBURGH *
OMAHA
NEW YORK
NEW ORLEANS
MINNEAPOLIS
WASHINGTON, D. C.
JACKSONVILLE
SALT LAKE CITY
ORANGEBURG, S. C.
PORTLAND, ORE.
CHICAGO
SAN FRANCISCO
ST. LOUIS
ALBANY

WHEREVER YOUR LOCATION...

YOU ARE ALWAYS CLOSE TO CLEAVER-BROOKS FACTORY-AUTHORIZED SERVICE

CLEAVER-BROOKS steam boiler service facilities are national — to enable you to get the most in performance through proper care and maintenance of your boiler.

YOU GET...

Starting Service: Boilers are placed in operation by Cleaver-Brooks field representatives who check installation, operation, and make a complete and detailed Field Report to you and to Cleaver-Brooks.

Operation Manuals: Your operators are trained in care and operation by Cleaver-Brooks and furnished with comprehensive, easy-to-understand operation manuals.

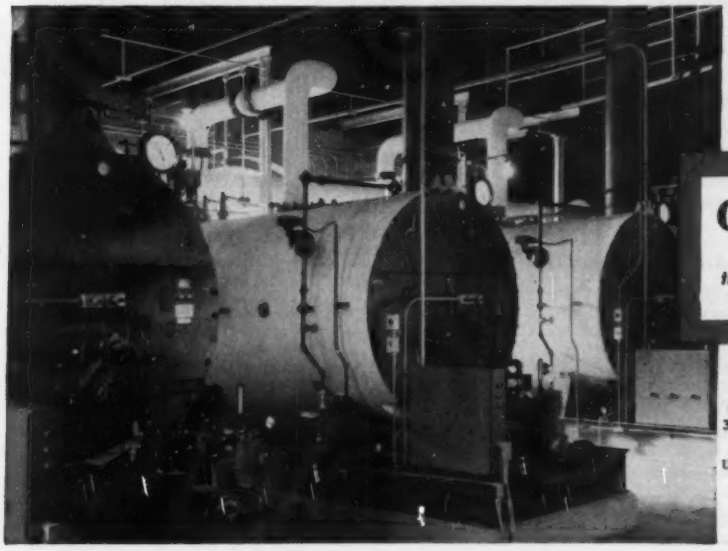
YOU HAVE READILY AVAILABLE

Parts: Cleaver-Brooks replacement parts are quickly available through field representatives, parts depots, and the factory.

YOU WILL FIND IT PAYS...

to equip with Cleaver-Brooks — steam boilers that operate at a guaranteed efficiency of 80% — burn gas, oil, or combination gas and oil — fully meet all codes — standard models available in sizes 15 to 500 hp.; 15 to 200 PSI.

*Just a few of the many Cleaver-Brooks Authorized service centers



Write for latest, fully illustrated and descriptive Cleaver-Brooks Steam Boiler catalog.

Cleaver-Brooks
STEAM BOILERS
the first and finest of their class

CLEAVER-BROOKS COMPANY
313-KE. Keefe Ave., Milwaukee 12, Wis., U. S. A.
Cable Address: Clebro-Milwaukeewis

Builders of Equipment for the Generation and Utilization of Heat • Steam Boilers • Oil and Bitumen Tank-Car Heaters • Distillation Equipment • Oil and Gas-Fired Conversion Burners

MULTI-VENT

T.M. Reg. U.S. Pat. Off.

Low Velocity Air Diffusion CEILING PANELS

in Pittsburgh's

GATEWAY CENTER BUILDINGS

Multi-Vent panels have been specified throughout for diffusing both cooled and heated air in all the interior bays of the first three office buildings, now under construction.

Rogers & Higgins, Pittsburgh
Meyer, Strong & Jones, Consulting Engineers

Selected for . . .

TRULY DRAFTLESS, NOISELESS AIR CONDITIONED COMFORT . . .
for over 8000 office workers, summer and winter.

Plus these great advantages possible only with Multi-Vent...

COMPLETE FREEDOM IN LOCATING MOVABLE PARTITIONS
Partitions may even bisect a diffusing panel without disturbing in any way Multi-Vent's incomparable over-all uniformity of room air movement, temperature, and humidity.

COMPLETE FREEDOM IN LOCATION OF LIGHTING FIXTURES . . .
for Multi-Vent panels are completely concealed in standard acoustical ceilings, and in no way interfere with interior design.

RADIANT PANEL HEATING AND COOLING EFFECT ADDS TO THE COMFORT FACTOR
The large areas of the ceiling which function as distribution plates for the Multi-Vent panels are heated or cooled to the temperature of the supply air.

See SWEET's Arch. & Eng. files or write for detailed literature.

MULTI-VENT DIVISION **THE PYLE-NATIONAL COMPANY**
1373 North Kostner Avenue Chicago 51, Illinois

There's No Other Welding Tee Like This!

FLOWLINE
TRADE MARK

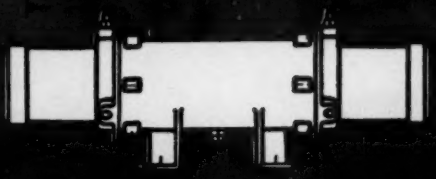
STAINLESS STEEL, MONEL, NICKEL and INCONEL WELDING FITTINGS
Preferred for Dependable Corrosion Service

Features of FLOWLINE Tees

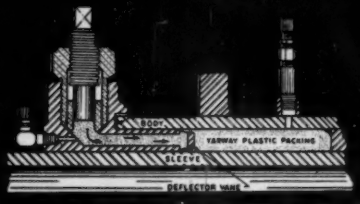
- Cold formed — seamless — by the exclusive Welding Fittings process.
- Reinforced crotch — tee is stronger than pipe with which it is used.
- Full center to face dimensions.
- Smooth interior walls.
- Ends machine tool cut and finished.
- Annealed, cleaned bright, passivated.
- Heat number permanently stamped on each tee as record of actual analysis and physical properties.
- Every tee is marked with type of metal, size, schedule, wall thickness, and FLOWLINE trade mark.

WELDING FITTINGS CORP.
NEW CASTLE, PENNSYLVANIA
World's Largest Manufacturer of Stainless Welding Fittings

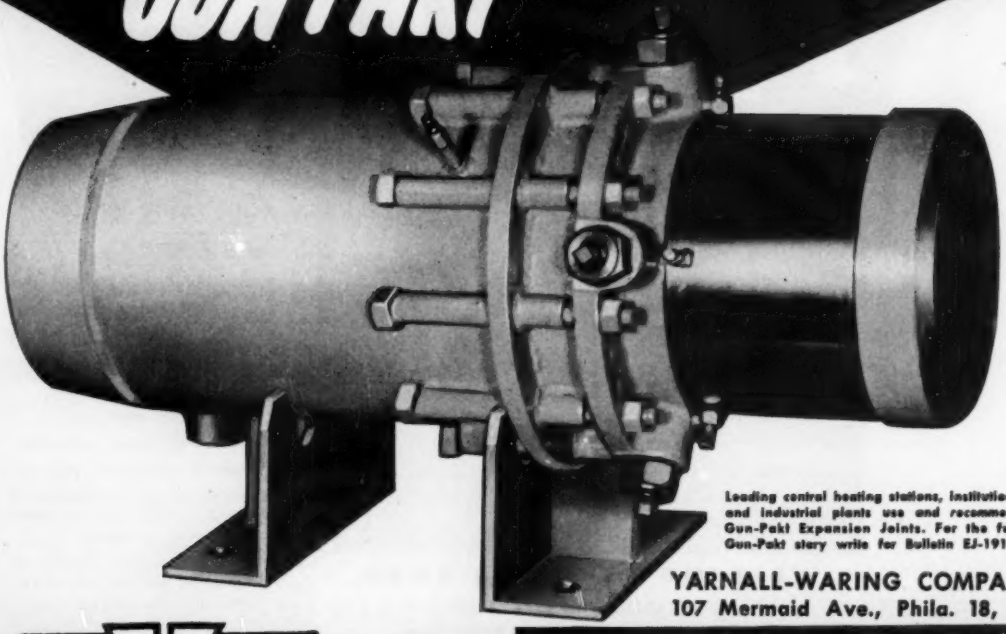
YOU NEED FEWER JOINTS



AND LESS MAINTENANCE



W... GUN-PAKT ...ints"

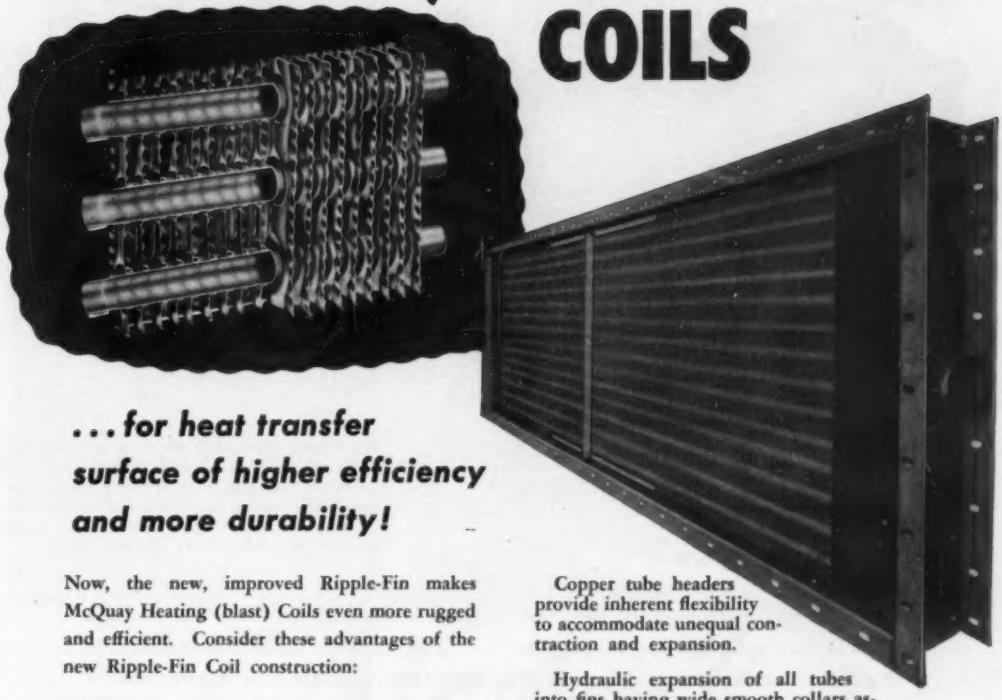


Leading central heating stations, institutions and industrial plants use and recommend Gun-Pakt Expansion Joints. For the full Gun-Pakt story write for Bulletin EJ-1912.

YARNALL-WARING COMPANY
107 Mermaid Ave., Phila. 18, Pa.

YARWAY GUN-PAKT EXPANSION JOINT

McQuay's NEW RIPPLE FIN COILS



. . . for heat transfer surface of higher efficiency and more durability!

Now, the new, improved Ripple-Fin makes McQuay Heating (blast) Coils even more rugged and efficient. Consider these advantages of the new Ripple-Fin Coil construction:

Produce a turbulent air flow pattern . . . closer and longer contact between the air stream and the coil surface, preventing air by-pass and producing faster heat transfer.

Offer greater heat transfer surface.

Give higher flexible strength with minimum air friction and cleaner operation.

Copper tube headers provide inherent flexibility to accommodate unequal contraction and expansion.

Hydraulic expansion of all tubes into fins having wide smooth collars assures permanent mechanical bond.

Intruded tube holes allow headers to flex and absorb uneven stresses.

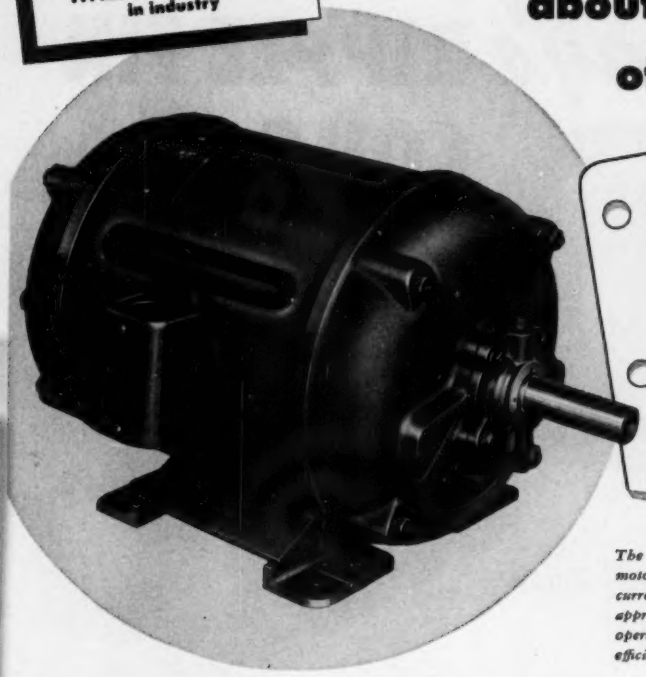
Available in a wide variety of styles and sizes. Both standard and special coils for steam, hot water, cold water, brine, direct expansion, refrigerant condensing, and other applications. Write, McQuay, Inc., 1601 Broadway St. N.E., Minneapolis 13, Minn. Representatives in all principal cities.

McQuay INC.

HEATING • AIR CONDITIONING • REFRIGERATION

Wagner
ELECTRIC MOTORS
...the choice of leaders in industry

it *pays* to be particular about your choice of motors...



the Wagner type **RA** *Motor offers the most simplified design to provide Repulsion-start... Induction Run*

The Wagner Type RA Motor starts as a repulsion motor with high torque but with extremely low starting current and switches to an induction motor while approaching rated speed to assure a constant high operating speed, even under overload, and a flat efficiency curve over a wide operating range.

The Wagner repulsion-start induction motor is truly industry's general purpose single-phase motor, for both fractional horsepower and integral horsepower applications. It is especially suitable for driving machines having high inertia or excessive friction at starting because of its ability to start heavy loads with low starting current. This feature is most important in the larger factional and in integral horsepower ratings.

This versatile motor is economical to maintain, requires only minimum servicing, is free from vibration and noise, and gives years of reliable service.

Build good will for your product by standardizing on Wagner Motors. There's a motor to fit your *exact* needs in Wagner's complete line. Bulletin MU-185 gives full information.

Wagner Electric Corporation
1891 1951

WAGNER ELECTRIC CORPORATION
6370 Plymouth Ave., St. Louis 14, Mo., U.S.A.

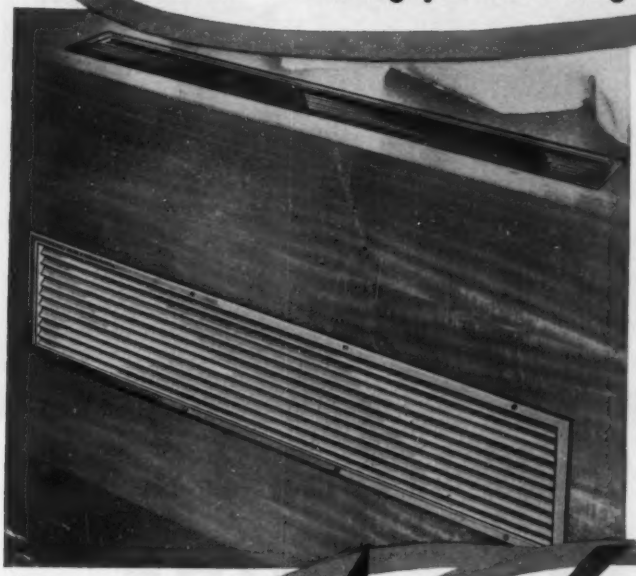
ELECTRIC MOTORS • TRANSFORMERS • INDUSTRIAL BRAKES
AUTOMOTIVE BRAKE SYSTEMS—AIR AND HYDRAULIC

BRANCHES IN 31 PRINCIPAL CITIES

MU-4

INSTALL Custom Designed CONVECTOR GRILLES

without increasing your building costs



- **EXTRA RUGGED**
  Made to *withstand heaviest use and abuse* which lower wall grilles must take.
- **TAMPER PROOF**
  No "see-thru". Extra-close spacing of louvers prevents gum wrappers—waste paper from being dropped between louvers.
- **EXTRA-HEAVY SUPPORT BARS**
  Heavy-duty steel bars on 6" centers give added strength where it is most needed.
- **MADE TO ANY SIZE**
- **OVER 70% FREE AREA**
- **EASILY INSTALLED**
  Precision built to fit snugly. Can be installed in marble, tile or other special surfaces.
- **EXTRA-WIDE BLADES FOR MOST EFFICIENT DEFLECTION OF AIR**
- **EACH DEFLECTING BLADE "HEMMED" FOR ADDED STRENGTH —ADDED SAFETY**
- **ALSO AVAILABLE WITH DAMPER AND KNOB CONTROL**

Above
Photo shows AIRFOIL convector grilles installed in John Hancock Building.

Architects—
Crane & Ferguson, Boston, Mass.

Gen. Contractors—
Turner Const. Co., Boston, Mass.

Heating & Ventilating Engineers—
Buerkel & Co., Inc., Boston, Mass.

Sheet Metal Contractors—
Stanley E. Priggen Co., Boston, Mass.

Air Foil
AIR CONDITIONING OUTLETS

Free

AIRFOIL CUSTOMED CONVECTOR GRILLES are *built above and beyond average demand. Give air distribution performance that's above and beyond average—YET COST IS KEPT AT STANDARD PRICES.*

Superior construction and performance usually reserved for the highest-priced grilles are incorporated as standardized features of this great new line of convector grilles. *They meet the most exacting specifications of architects and engineers.*

AIRFOIL CONVECTOR GRILLES are better designed—more durable. Feature for feature, dollar for dollar—they cannot be duplicated. Made with a "decorator's touch," *they add new beauty to any installation.*

CHECK TYPE OF GRILLE ON WHICH INFORMATION IS DESIRED

- ☐ Air conditioning outlets
- ☐ Return air grilles and registers
- ☐ Volume controllers
- ☐ Perforated metal and ornamental grilles
- ☐ Door ventilators
- ☐ Special made-to-order grilles

TITUS MANUFACTURING CORP., WATERLOO, IOWA

- ☐ Rush information on Convector Grilles.
- ☐ Send complete catalog.
- ☐ Send literature on above checked items.

NAME_____

ADDRESS_____

CITY_____ STATE_____

INSIDE: continued fair and warm

with SPANG CW PIPE

RADIANT HEATING INSTALLATIONS

Spang CW Pipe is performance-proved for closed water heating systems. For over half a century, the ease of fabrication—welding, bending, cutting, threading—has made Spang CW Pipe a favorite.

Spang CW is not only easy to form, but it's strong, too. The coefficient of expansion of Spang pipe is practically the same as that of concrete and plaster. Add the advantages of *low cost* and *long life*, and you'll see why Spang CW Pipe is in great demand.

Call on your friendly Spang CW Distributor the next time you need pipe, fittings, valves, fixtures and other piping materials. You can rely on him and the Spang CW Pipe he sells.

SPANG-CHALFANT

Division of The National Supply Company

GENERAL SALES OFFICES: Grant Bldg., Pittsburgh 30, Pa.

District Sales Offices: Atlanta, Boston, Detroit, Houston, Los Angeles, New York, Philadelphia, Pittsburgh, St. Louis

It pays well to specify ILG Unit Heaters...

Two-piece graduated header
Cast frame keeps parts aligned
Self-Cooled Motor never "slow-roasts"
No brazed, soldered or welded joints
Dynamically balanced fan wheel
Bottom header "floats"

. . . They cost less over multi-year operation!

● Before you specify *any* unit heater, take a look inside. Make certain the core is made with fins *pressed* onto tubes. Any soldered, brazed, or welded joints may cause trouble. See if it has a two-piece header, with top bolted on. Does the bottom header "float" to permit expansion and contraction? Insist on a self-cooled motor that never "slow-roasts". Check the decibel ratings for quietness of operation. Are both motor and heater covered by a "One-Name-Plate" Guarantee? For over 35 years, pioneer ILG Unit Heaters have been made of finest quality materials in accordance with best steam practice. Many of the original ILG units are still giving complete heating satisfaction. Now you can get ILG units in a wide range of types and capacities—steam, hot water, electric, or gas-fired. For complete data, phone nearby Branch Office (consult classified directory) or mail coupon today.

ILG

UNIT HEATERS

STEAM • HOT WATER • ELECTRIC • GAS-FIRED

Free! Colorful bulletin "Performance is the Pay-Off"—facts and figures on ILG savings.

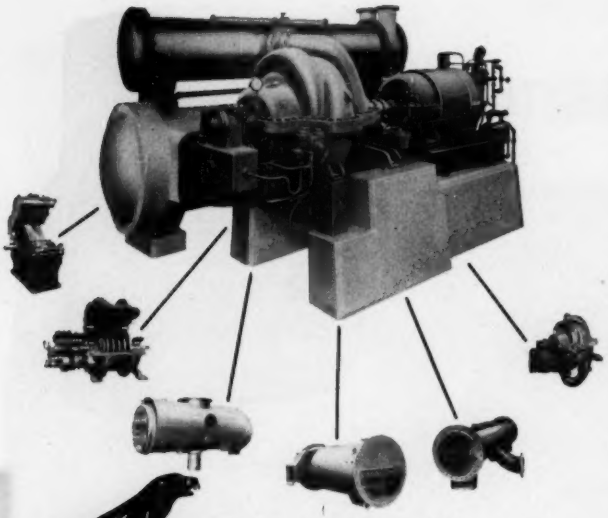
☐ Please send bulletin "Performance is the Pay-Off"

Firm Name_____

Individual_____ Title_____

Address_____

City_____ State_____



Where do you get

UNDIVIDED RESPONSIBILITY

in an installation of centrifugal refrigeration?

Worthington will "wrap up a package".

Unlike other manufacturers of air conditioning and refrigeration equipment, Worthington *makes*—not just assembles—all the major components for each installation.

Compressor, condenser, cooler and such drive equipment as steam turbines, steam condensers, motors, and step-up gears—are all made in Worthington's own plant—each carefully designed for balanced operation with its companion components.

So the builder and owner can place full responsibility on the one supplier —Worthington.

Worthington centrifugal systems are used with most refrigerants and for any process—chilling water, brine, chemicals, lubricating oils—for temperatures as low as minus 160 F, capacities from 150 to 2600 tons.

A typical Worthington compressor feature is the arrangement of the volute passages and impellers to counterbalance the radial and axial thrusts, respectively, in the various stages.

Write for Bulletin C-1100-B14 on Worthington centrifugal refrigeration.

Worthington room conditioners for both heating and cooling are built to operate with chilled water or direct expansion cooling, capacities from 350 to 600 cfm for under-window installation.

PACKAGE UNITS SELECTED TO COOL HUGE OFFICE BUILDING

This is an excellent example of how Worthington's complete line makes it possible to select exactly right equipment.

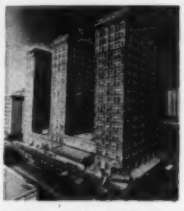
The new office building at 488 Madison Avenue, New York—home of many famous magazines and large industrial firms—is air conditioned primarily by package units, assisted by a Freon-12 reciprocating system with chilled water and steam coils.

Purpose of using package units in a big building like this is to provide for a variety of conditions imposed by both the building and the type of tenants: air conditioning needed only on top floors during certain seasons, difference in sun load on various sections, certain tenants working late hours but only with skeleton forces.

Second through 20th floors are handled by 38 Worthington 20 and 25 ton Package Air Conditioners, two per floor. Basement, first floor and top three floors are handled by two Worthington 75-ton Freon-12 compressors complete with condensers, pumps, water coolers and five central station units with chilled water and steam coils. Total capacity is 1050 tons.

Builders and owners: Uris Bros. Consulting engineer: Henry Oehrig. Air conditioning contractor: Raisler Corp. Architects: Emory Roth & Sons. All of New York.

RICE HOTEL MULTIPLIES COMFORT-COOLING WITHOUT REQUIRING MORE ROOM



Last year, Houston's Rice Hotel completed air conditioning its entire building, including a thousand guest rooms, dining rooms and meeting rooms, by installing three Worthington 600-ton centrifugal chilled water systems.

This equipment, utilizing Freon-11, replaced ammonia refrigeration equipment having a capacity of 350 tons, yet occupies no more space than formerly.

Worthington equipment was selected primarily because Worthington could provide 100% equipment of its own make. The compressors are driven by Worthington steam turbines and steam condensers.

Engineer: Reg. F. Taylor. Mechanical Contractor: Charles G. Heyne & Co. Architect: Kenneth Franzheim. All of Houston.

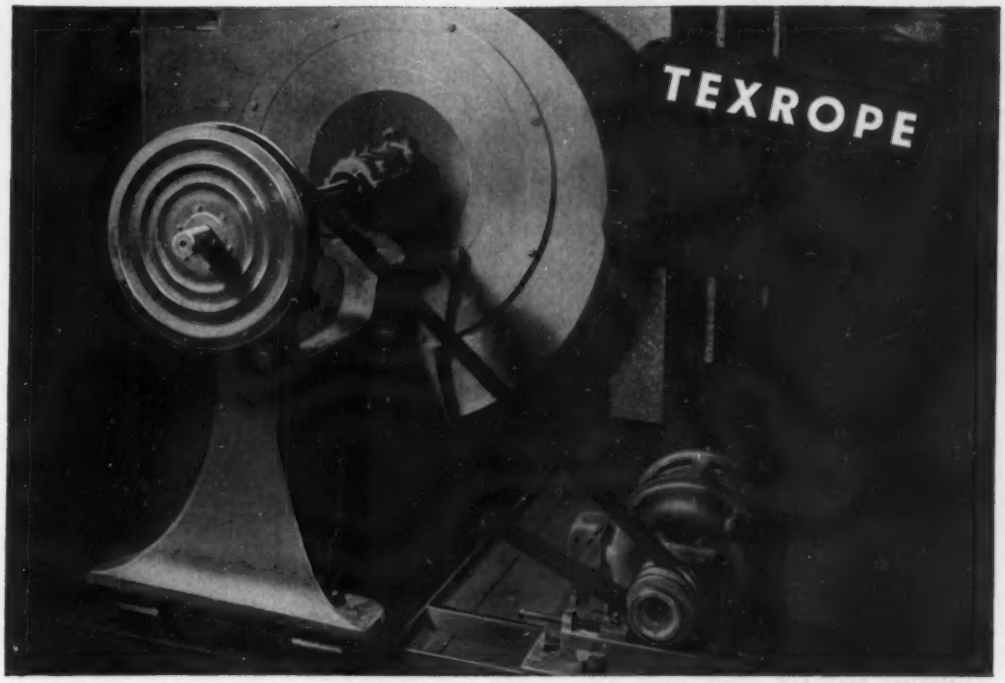
WORTHINGTON

AIR CONDITIONING AND REFRIGERATION

INVESTIGATE

MORE WORTH WITH WORTHINGTON

Consult Classified Telephone Directory for nearest Worthington distributor. Worthington Pump and Machinery Corporation, Air Conditioning and Refrigeration Division, Harrison, N. J., specialists in air conditioning and refrigeration for more than 50 years. A-1-2



Change Fan Speeds This Fast, Low Cost Way

ALL THESE ADVANTAGES are yours with *Vari-Pitch* drives:

1 There's a wide range of types and sizes to fit operating conditions. Big or small, Stationary control or Motion control types are available.

2 *Texrope* drives are noiseless and tend to dampen vibration of other parts.

3 It takes only a few minutes to change the speed of a fan equipped with a *Vari-Pitch* Stationary Control drive. Takes even less time to balance and adjust system with Motion Control drives.

4 You get an infinite number of speeds from one sheave.

5 Speed of fan will not change once it has been set.

PLUS VALUES

One phone call brings you everything you need for your drive—motor, base, starter, sheaves and belts. In addition, you get the extra engineering help in field and factory that comes from Allis-Chalmers long experience. For A-C has more V-belt drive installations in industry than any other manufacturer.

Get one day, one call service on your next fan job by calling your nearest Allis-Chalmers Authorized Dealer or Sales Office, or write for bulletin 20B6082B, Allis-Chalmers, Milwaukee 1, Wisconsin.

A-2327

***Texrope* and *Vari-Pitch* are Allis-Chalmers trademarks.**

ALLIS-CHALMERS

Sold . . .

Applied . .

Serviced . . .

by Allis-Chalmers Authorized Dealers, Certified Service Shops and Sales Offices throughout the country.

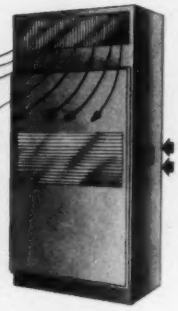
MOTORS — ½ to 25,000 hp and up. All types.

CONTROL — Manual, magnetic and combination starters; push button stations and components for complete control systems.

PUMPS — Integral motor and coupled types from ¾ in. to 72 in. discharge and up.

Now Garden-Fresh Air Everywhere with NO Mechanical Operating Costs!

RENOVAIR AIR DEODORIZER



RENOVAIR frees the air from even harsh paint and smoke odors, without perfume! And the RENOVAIR Gyrostatic Evaporator fits easily *inside* any air conditioning system or unit, and operates without an additional motor . . . reveals its presence only by the effect of garden-fresh air all the time! Simple to install . . . costs *nothing* to run!

MAINTAINS PLEASANT, PRODUCTIVE ATMOSPHERE EASILY, INEXPENSIVELY. Offensive odors can be costly . . . but RENOVAIR keeps air garden-fresh for only pennies a week! Clean, pleasant air by RENOVAIR will *attract* customers into stores and restaurants . . . keep employees happy and productive. Yet, RENOVAIR's foolproof Gyrostatic Evaporator installs easily, costs nothing to operate! RENOVAIR also performs perfectly from spray guns, fogging machines, or from the 12-ounce wick bottle for limited spaces.

NEUTRALIZES ODORS WITHOUT PERFUMING AIR— RENOVAIR uses non-toxic elements found in plant life —to neutralize indoor odors much the same as masses of green foliage freshen the air outdoors. *Contains no formaldehyde or chlorophyll* . . . will not burn, nor will it harm the sense of smell.

WHEREVER PEOPLE BREATHE RENOVAIR FILLS A NEED!

RESTAURANTS	THEATRES
STORES	BOWLING ALLEYS
WASHROOMS	HOTELS & APARTMENTS
HOSPITALS	OFFICES
SCHOOLS	INDUSTRIAL PLANTS

FOR LIMITED NON-AIR CONDITIONED SPACES

Use this Handy RENOVAIR WICK TYPE DEODORIZER

JUST PULL UP THE WICK . . .

enjoy garden-fresh air without perfume

12-oz. bottle only **79¢**

Get complete details FREE in this handy RENOVAIR folder! Contains full description of how *you* can eliminate costly odor problems with inexpensive RENOVAIR and RENOVAIR's Gyrostatic Evaporator. Mail coupon *today!*

Boyle-Midway Inc., Correctair Division
22 E. 40th St., New York 16, N. Y.

Please send me your FREE RENOVAIR folder *at once!* I'm interested in further details.

Name_____

Firm_____

Address_____

City_____ Zone_____ State_____

Boyle-Midway Inc., Correctair Division
22 E. 40th St., New York 16, N. Y.
Cranford, N. J., Chamblee, Ga., Chicago, Los Angeles, Toronto

See you in Chicago!
at the 7th ALL-INDUSTRY
REFRIGERATION AND AIR-CONDITIONING
EXPOSITION
NAVY PIER
NOVEMBER
5-8 • • 1951
WELCOME
CHICAGO
ST. LOUIS
ATLANTA
DALLAS
LOS ANGELES
N.Y.
CLEVELAND
PHILADELPHIA
KNACK
HOCKER
JAEGER
BARRY
GROTE
REICHENBACH
SILVEY
ANSON
McCARTY
POINDEXTER
FROBISHER
NOERF-26
For All Sizes
and Types of Refrigeration and
Air-Conditioning Applications
Sporlan Manufactures
SOLENOID VALVES • SOLENOID PILOT CONTROLS
MODULATING PILOT CONTROLS • REFRIGERANT DISTRIBUTORS
STRAINERS • CATCH-ALL FILTER-DRIERS
and the Only THERMOSTATIC EXPANSION VALVES with
FLOW MASTER ELEMENTS AND SELECTIVE CHARGES
SPORLAN VALVE COMPANY
7525 SUSSEX AVE. • ST. LOUIS 17, MO.
SPORLAN

From Sprawling Plants to Towering Factories

Trane Serves Defense Industry Everywhere

In defense plants everywhere . . . from sprawling aircraft plants in California to towering factories in Brooklyn . . . from shipyards in New Orleans to an instrument factory in Minneapolis . . . from giant atomic projects to smallest shop — Trane heating equipment serves everywhere.

And it serves plants of every type, too! For example . . .

Assembly Lines — In Detroit at a tank plant, where the huge General Pershings are assembled between walls hundreds of feet apart, Trane Torridors throw blankets of heat over wide assembly areas.

Paint Shops — A west coast plane factory created a partial vacuum and plenty of cold drafts when they exhausted fumes from their paint shop. They used Trane Heating Coils in outside walls to heat the air used to correct negative pressure and kill the drafts.

Gauge Rooms — A precision bearing manufacturer in Indiana wanted to protect his master gauges against expansion and contraction caused by temperature changes. Trane Climate Changers teamed with a Trane Compressor were installed in the gauge room — maintain constant temperature to within one degree.

Stock Stations — In a New York radar factory, a forest of parts-storage bins blocked air circulation and prevented even heating. A Trane Projection Unit Heater, mounted above each storage area, solved the problem economically by pouring heat down over the shelf sections and spread heat to every corner.

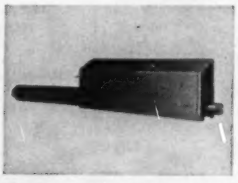
Shipping Areas — The busy shipping doors of a northern munition plant let in blasts of sub-zero air every time they opened. To stop the cold air, Trane Horizontal Unit Heaters hang a curtain of heat over each door opening.

And in tool rooms, drafting rooms, offices, cafeterias, rest rooms, lobbies—everywhere in defense plants—heating problems of all types are solved effectively with matched Trane Products.

Whatever your heating, ventilating, cooling or air conditioning problem, whether defense plant, military base, school, hospital or housing, look for the answer in the Trane line.

Both Projection and Horizontal Unit Heaters can be furnished with diffusers that can be adjusted to direct heat where desired.

This powered Trane Roof Ventilator is a complete factory ventilating system. It can circulate both outside and recirculated air.



Easy-to-install Trane Wall-Fin Heaters provide the ideal low-cost heating answer to window drafts and perimeter heating problems.

TRANE

MANUFACTURING ENGINEERS OF HEATING, VENTILATING AND AIR CONDITIONING EQUIPMENT

THE TRANE COMPANY, LA CROSSE, WIS.
Eastern Mfg. Division . . . Scranton, Pa.
Trane Company of Canada, Ltd., Toronto
Offices in 80 U. S. and 14 Canadian Cities

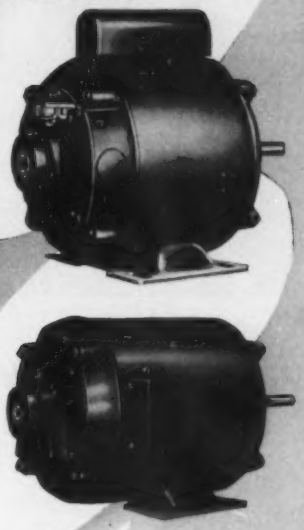
Century MOTORS

FOR HEATING, VENTILATING AND REFRIGERATION

Assure Satisfactory Performance

Because:

- Correct operating characteristics provide top performance for each kind of equipment they drive.
- They start quietly and run quietly.
- Sturdy construction means long life — insulation resists dampness in basements where much of equipment is used.
- An Authorized Century Service Station is near to give fast service when it is required. Get acquainted with your Century Service Station operator.



Typical Century Motor Applications

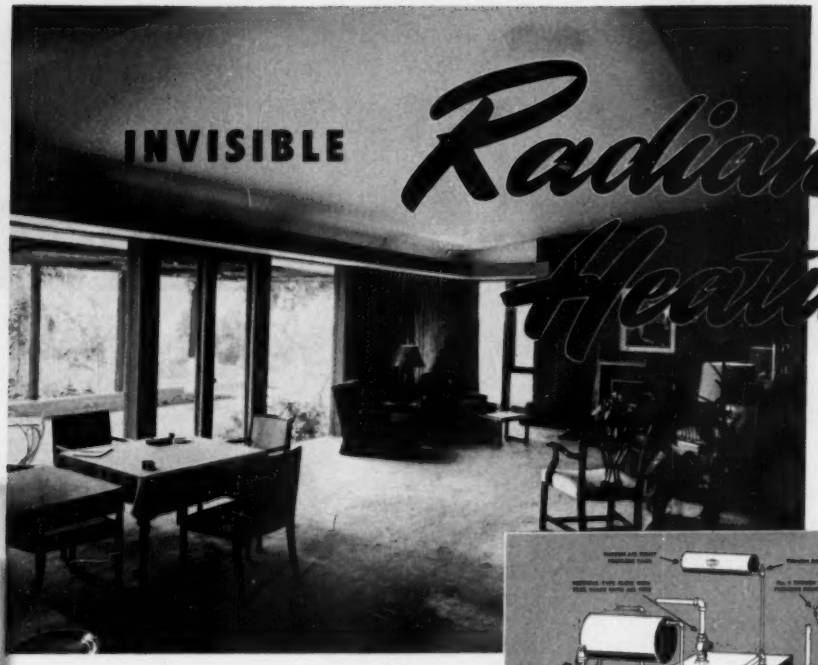
- **Oil Burner Motors** — meet requirements of underwriters — each motor is balanced — smooth, trim appearance, easy to clean — compact dimensions — all mounting dimensions industry standard.
- **Unit Heater Motors** — NEMA standard for shaft mounted Fans and Blowers. Furnished: single speed — two speed or adjustable speed. For operation on single or polyphase or direct current.
- **Fan or Blower Motors** — For attic fans — window fans — exhausters — air spreaders — furnace blowers. A. C. — D. C. Motors for all forms of air moving jobs.
- **Stoker Motors** — For home and commercial sizes.
- **Refrigeration Compressor Motors** — Up to 400 H. P. — single or multi-speeds — high starting torque for hard-to-start loads — designed for use with automatic starters for refrigeration cycling. Century motors are widely known for their unusually quiet *starting* and *running*.
- **Pump Motors** — Up to 400 H. P. — for water circulating heating systems — refrigeration systems — all form of liquid moving.

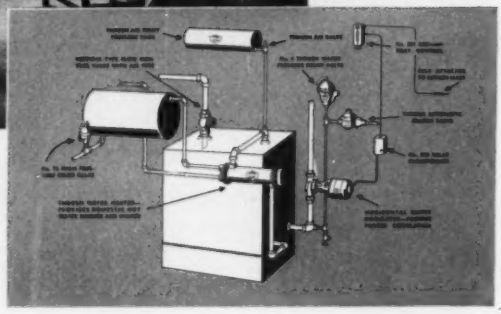
Century offers a wide range of types and sizes up to 400 H. P. — with operating characteristics to suit the wide range of driven equipment. Call a Century Branch sales office or your local distributor.

711

Century C MOTORS

Century Electric Company Is Celebrating its 50th Year in the Electrical Industry





forced circulating

THRUSH FLOW CONTROL
HOT WATER HEAT

THRUSH hot water heating system is flexible. With forced circulation and completely automatic control you can install any type of modern heating your customers desire and be sure of complete satisfaction. Heat from radiant coils hidden in ceiling or floor, radiant baseboards or convectors, with Thrush Flow Control System provide perfect comfort without overheating, automatically compensating for weather changes. Zoning is simple and inexpensive. Get all the facts on profitable Thrush equipment now. See your wholesaler today or write Dept. E-10.

THRUSH HORIZONTAL
WATER CIRCULATOR

THRUSH
H. A. THRUSH & COMPANY
PERU • INDIANA

STILL YOUR BEST BUY...

Where pipes meet permanently...

W-S FORGED FITTINGS

in CARBON, ALLOY and STAINLESS STEELS

. . . Still your best buy, because W-S longer service life and increased dependability give that permanency which will lower maintenance costs . . . They are drop forged.

Basic materials are selected from a wide choice of carbon, stainless and alloy steels and then subjected to the most exacting metallurgical controls from melt to bar. Through these precautions and subsequent precision machining operations, W-S assures the utmost in accuracy of finish, perfection of threads, sockets, angles and concentricity. All W-S Fittings, — Screwed and Socket Welding Types, — are finally instrument inspected.

W-S Bulletin A3-50 details the Carbon Steel Line. Bulletin S-1 is devoted to Stainless and the Alloys. W-S will gladly furnish information on the new FEATHERLITE Fittings — a recent big step in a wide range of services. Write today for the specific bulletin you desire.

Sold Through Leading Distributors

9-L-2

DISTRIBUTOR PRODUCTS DIVISION

WATSON-STILLMAN

Established 1848

ROSELLE, NEW JERSEY

Designers and Manufacturers of Forged Steel Fittings, Valves, Flow Regulators, Steam Traps, Flanges, Unions, Pipe Stanchions and Hydraulic Equipment

HURRY! HURRY!

see 'em alive and in the flesh

at the 7th All-Industry Show in Chicago

ALCO's Booth No. 247

Here's your chance to see ALCO's prize collection of refrigeration "brains"—the most outstanding group of its kind ever gathered together. They walk, they talk—and that's not all! Watch 'em perform when you feed 'em tough refrigeration problems.

Seriously, ALCO and each of the "fine specimens" shown above, invite you to visit Booth No. 247 for an enjoyable and profitable get-together. A complete display of all the latest ALCO valves and equipment will be there for you to see.

ALCO VALVE CO.

861 KINGSLAND AVE. • ST. LOUIS 5, MO.

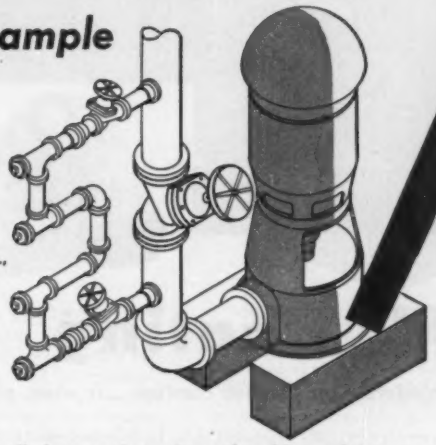
4861

Designers and Manufacturers of Thermostatic Expansion Valves, Evaporator Pressure Regulators; Solenoid Valves, Float Valves; Float Switches

for outstanding service

on Corrosive Well Water

...for example



The Installation—
Barr Rubber Products Co.,
Sandusky, Ohio

PROBLEM: To eliminate costly seating and packing maintenance, and frequent replacement of valves on plant well-water pump. Valves previously used highly unsatisfactory, having maximum life of 6 months.

WORKING CONDITIONS: Sulphur content of water extremely high. Valve constantly exposed to severe corrosive and erosive effects. Operated infrequently; yet easy operation, positive seating are prime requisites.

SOLUTION TO PROBLEM: Crane Packless Iron Body Diaphragm Valves featuring separate disc and diaphragm design. Three-inch No. 1611 flanged end valve on main discharge; ¾-inch No. 1610 screwed end valves on by-pass.

RESULT: While other valves lasted only 6 months or less, Crane Diaphragm Valves show no effects of service, after more than a year. They operate smoothly . . . seat tightly . . . no maintenance whatsoever needed to date!

Another typical demonstration of superior quality, and the low-cost performance of Crane Valves. That's why . . . More CRANE VALVES are used than any other make!

...Choose Dependable CRANE VALVES

No. 1611 Crane Iron Body Diaphragm Valve —one of a full line suited for many services. Literature on request from your Crane Branch or Crane Wholesaler.

CRANE CO.

General Offices:
836 S. Michigan Ave., Chicago 5, Ill.
Branches and Wholesalers Serving All Industrial Areas

VALVES • FITTINGS • PIPE • PLUMBING • HEATING

B&G *Hydro-Flo* Heating

...maintains the right temperature for genuine comfort...in shop, office or home

To every type of building—factory, home, apartment or institution—B & G *Hydro-Flo* Heating offers outstanding comfort at low operating cost. The reason lies in positive control of the heat supply which prevents waste yet provides adequate heat for every weather condition from fall to spring.

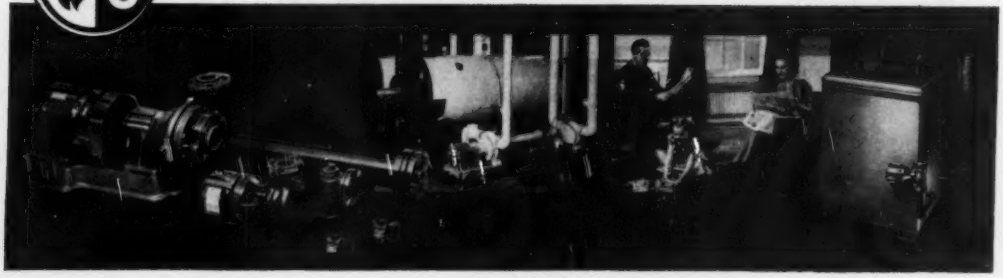
The inherent superiorities of water as a heating medium are fully developed in B & G *Hydro-Flo* Heating—*a forced hot water system*. Mechanically circulated water can be so closely controlled that operating cost is held to a minimum. Heat *production and distribution* is automatically matched to every change in the weather, preventing both over and under-heating.

In industrial plants, B & G *Hydro-Flo* Heating can be zoned to provide temperatures best suited to occupational activities . . . 68° in the shops, 72° in the offices, or whatever temperatures are desired. In apartment or commercial buildings, zoning permits each tenant to have individual control of temperature.

B & G *Hydro-Flo* Heating is not limited to new buildings . . . the same equipment can be applied to present heating plants. Send for catalog giving complete product information.

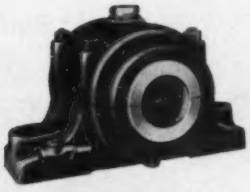
BELL & GOSSETT
COMPANY

Dept. CF-5, Morton Grove, Ill.
Canadian Licensee: S. A. Armstrong, Ltd., 1400 O'Connor Drive, Toronto, Canada



QUIET DODGE BEARINGS

THE MOST COMPLETE LINE FOR FAN AND BLOWER SERVICE



SLEEVOIL PILLOW BLOCK

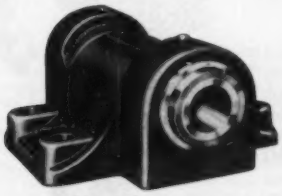
A precision-built, ring-oiling babbitted bearing, self aligning and exceptionally quiet in operation. Special seals prevent oil leakage and keep dirt out of the bearing.

WATER-COOLED SLEEVOIL

Specially designed for applications where elevated temperatures are encountered. Dodge Sleevoil bearings combine quietness with exceptional load carrying capacity; are available in shaft sizes from 1-11/16" to 8".

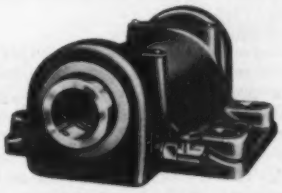
DODGE BRONZOIL

Capillary bronze bushing has capacity of one-third its volume in oil. Reservoir with close fitting wick around bushing provides ample lubrication. Oil resistant grommets available for noise isolation. Sizes 1/2" to 1-1/4".



BALL BEARING PILLOW BLOCK

Single row, deep groove ball bearings. Inner race extended to form sleeve which carries shaft. Piston ring seals retain lubricant, exclude dirt. For arrangement No. 2. Shaft sizes 15/16" to 2-1/4".



BRONZE BUSHED PILLOW BLOCK

Designed for arrangement No. 2 installations. Two bronze bushings of high lead content and T section rings, sealed against dirt. Composition rings inside thrust collar prevent oil leakage. For shaft sizes 15/16" to 2-3/16".

CALL THE TRANSMISSIONEER
your local Dodge distributor, for information about the entire Dodge line of bearings for fan and blower service. Look for his name in the Classified Telephone Directory under "Power Transmission Equipment." Or write to the factory.

DODGE MANUFACTURING CORPORATION
1600 UNION ST., MISHAWAKA, IND.

DODGE
of Mishawaka, Ind.

FIRST IN POWER TRANSMISSION MACHINERY

FOR YOUR NAME PLATE REQUIREMENTS, WRITE OUR SUBSIDIARY, CHICAGO THRIFT ETCHING CORPORATION, 1600 N. SHEFFIELD AVE., CHICAGO, ILLINOIS

Are you turning in all your SCRAP?

Don't wait for "George" to do it

You'll find your local scrap dealers listed in the yellow pages of the phone directory.

IF you are a steel user, this important job of getting more scrap back to the mills is directly up to *you*. You just cannot afford to sit idly by while the scrap shortage gets worse. For unless everyone really pitches into this job of digging out all the scrap possible, steel production is bound to suffer, and every steel user, in more or less degree, will suffer too.

More scrap means *more* steel—it's as simple as that.

Right now some mills have only a bare two-days' supply of scrap on hand. Others have even less. Some steel-making furnaces already have had to shut down for lack of scrap. The situation is serious. Only you can help improve it.

By turning in every piece of worn-out equipment, every obsolete tool and machine, in fact every pound of iron and steel scrap you can comb out of your plant, you'll be helping relieve the worst scrap shortage since Pearl Harbor days . . . and the steel industry will be able to produce more of the steel you need.

Remember—it takes at least one-half ton of scrap to make one ton of steel. To maintain steel's present high production schedules requires more than 1400 carloads of industrial scrap *every* day. So turn in your scrap—ALL your scrap—and keep the mills rolling. This is more than a shortage. It's an emergency that vitally concerns you—and us—and the Nation.

This page would ordinarily be used to tell you about

NATIONAL STEEL PIPE

but, because without SCRAP we cannot produce steel, we are asking instead for your all-out help in getting more SCRAP to the mills.

NATIONAL TUBE COMPANY, PITTSBURGH, PA.
COLUMBIA STEEL COMPANY, SAN FRANCISCO, PACIFIC COAST DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

USS

1-1348-A

UNITED STATES STEEL

ANOTHER PROMINENT BUILDING

"Buffalo"

The Washington Post
BUILDING • WASHINGTON, D. C.

Washington Post Building. Engineer: Albert Kahn, Associated Architects and Engineers, Inc. Contractor: John McShain, Inc. Mechanical Contractor: Standard Engineering Co.

Above, a large "Buffalo" Air Washer supplying clean, properly tempered air at all times in the Washington Post Building. At left are two of the large "Buffalo" Limit-Load Fans keeping air circulating throughout the building.

Clean, fresh air at right temperature and right humidity went into the planning of this famous and ultra-modern newspaper building. Why? Because proper air control in a building directly affects the efficiency, morale and well-being of those working inside. This has been proven time and time again in factory, office building, store and, in fact, any place where people congregate. And "Buffalo" Fans, Pumps and Air Conditioning Units have been doing their jobs to such satisfaction that they have become a standard to many of the leaders in the construction and engineering fields. You are safe in recommending "Buffalo", the name you see in big installations throughout the world.

AIR — VITAL TO DEFENSE

Thousands of "Buffalo" Fans, Pumps and Air Conditioning Units are today rendering valuable service in every essential industry, from aircraft to textiles, in mines and on shipboard — helping the worker, bettering the product, operating 24 hours a day with little attention. Full details on any unit on request.

Above right, two other "Buffalo" Fans ventilating the 7-story building: left, a small Belted Vent Set and right, to medium sized Limit-Load Fans.

"Buffalo" FIRST FOR FANS

BUFFALO FORGE COMPANY

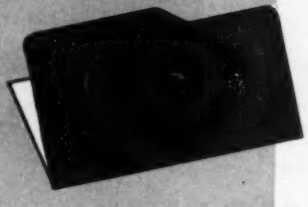
171 MORTIMER ST. BUFFALO, NEW YORK

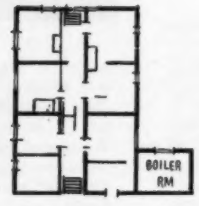
Canadian Blower & Forge Co., Ltd., Kitchener, Ont. Branch offices in all Principal Cities

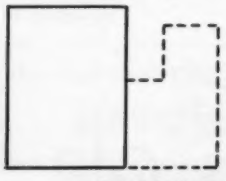
VENTILATING FORCED DRAFT | AIR WASHING COOLING | AIR TEMPERING HEATING | INDUCED DRAFT EXHAUSTING PRESSURE BLOWING

...plus Exceptional Economy in FUEL CONSUMPTION

H. B. Smith boilers' quick response gives greatest value for the fuel dollar. Water tube design and unique flue travel insure maximum utilization of heat. They are easily convertible from one fuel to another.







H. B. Smith *low-draft* cast iron boilers operate efficiently with the low chimneys which should identify modern school design. H. B. Smith "Mills" Boilers have exceptionally low draft loss. Hence lower chimneys can be used without the need for complicated induced draft mechanisms.

H. B. Smith sectional header-type boilers are compact units. The precision-machined parts are easily moved through conventional entrances for quick assembly on the site in small boiler rooms. No necessity for structural changes when replacing with H. B. Smith boilers.

As the school is increased in size, it is not necessary to replace H. B. Smith boilers with complete new units. They are easily expansible by the addition of new sections to assume greater heating and hot water requirements.

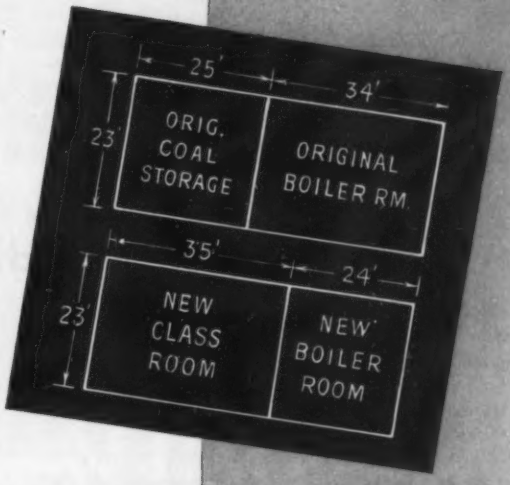
FOR COMPLETE INFORMATION . . .
Write for the booklet "Facts to Consider When Selecting the Boiler for Modern School Heating," which contains authentic case histories.

TRANSFIGURATION SCHOOL, TARRYTOWN, NEW YORK, USES A LOW CHIMNEY

The one-story construction which calls for a low chimney, and large window area which demands higher-than-usual heating capacity, presented no problem to Architect Robert A. Green of Tarrytown. A single No. 440 Smith-Mills boiler fired by a horizontal rotary burner provides ample heat for the school's needs. No complicated induced-draft mechanism was necessary with this H. B. Smith *low-draft* boiler — a fact which has been a boon to modern designers since it results in marked savings due to chimney construction and the absence of controls.

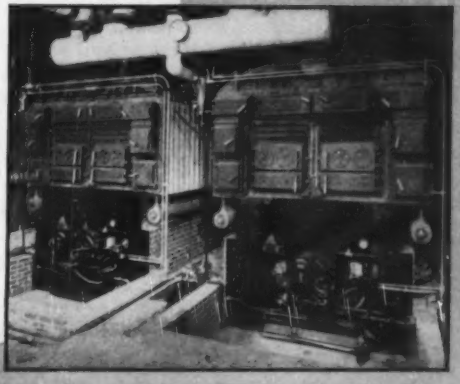
POST ROAD SCHOOL AT WHITE PLAINS, NEW YORK, GAINS A CLASSROOM

When two No. 400-S-20 Smith-Mills oil-fired boilers replaced the old boilers in the Post Road school in 1949, much-needed classroom space was gained. Not only did the installation require no structural changes (Smith boilers are easily moved through conventional entrances) but the room needed for them was much less as it was not necessary to provide space for tube replacement. The original boiler room and coal storage was 23 ft. x 59 ft. With the Smith boilers it was possible to gain a 23 ft. x 35 ft. classroom by moving one wall, saving about $40,000 which would have been the cost of a one-room addition.



BOILERS KEEP PACE WITH PENN WYNN, PA. ELEMENTARY SCHOOL AND SAVE $3724

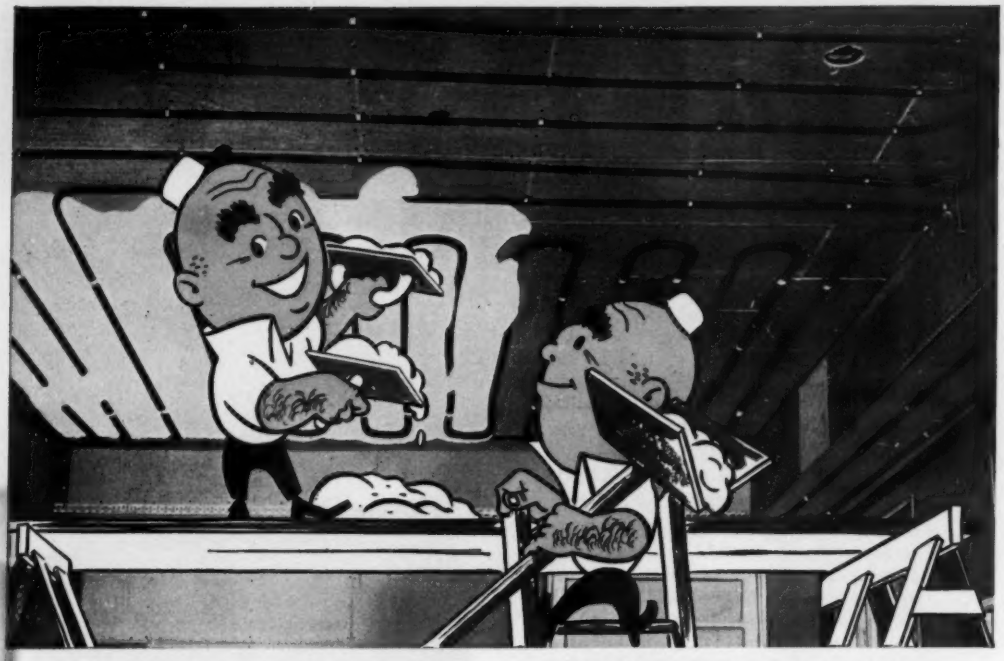
Two 10-section oil-fired No. 60 Smith boilers were original equipment when the school was built in 1930. When it was expanded in 1949, the boilers were increased to 26 sections each, one boiler carrying the load while the other was enlarged. Believing that the boilers had served their normal usefulness, replacement was considered at the time, but when inspection revealed that the Smith boilers would be good for at least another 20 years, it was decided to expand them — a decision which meant saving $3,724 over the cost of the cheapest new boilers available.



H. B. Smith

CAST IRON BOILERS

The H. B. SMITH CO., INC. • WESTFIELD, MASS.



Bundyweld Tubing . . . plays double role in better radiant heating

Handles better at your building site, **Performs** better in your systems . . .

Because Bundyweld is better tubing . . . the only tubing that's double-walled from a single strip, with a patented beveled edge. Copper-brazed through 360° of contact, its walls are safe, solid, strong.

Rugged Bundyweld arrives at your building site (one end expanded if specified) ready to ride right through fabrication steps. One man bends dead-soft Bundyweld on a simple fixture, joins the formed, rigid grids in leakproof union by soft or hard soldering. Just two men position them. There's never a worry about dents or structural collapse.

Performance in your systems is just as smooth. For Bundyweld is scale-free. Water flow stays clean, even, steady. Bundyweld's thinner wall radiates heat faster, more effectively, as well.

Check your *Sweet's Architectural File* for more information. Or write: ***Bundy Tubing Company, Detroit 14, Michigan.*** Whatever your needs, we'll do our best for you, with the understanding, of course, that defense orders must come first.

Bundyweld® Tubing

DOUBLE-WALLED FROM A SINGLE STRIP

WHY BUNDYWELD IS BETTER TUBING

Bundyweld starts as a single strip of basic metal, coated with a bonding metal. Then it's . . .

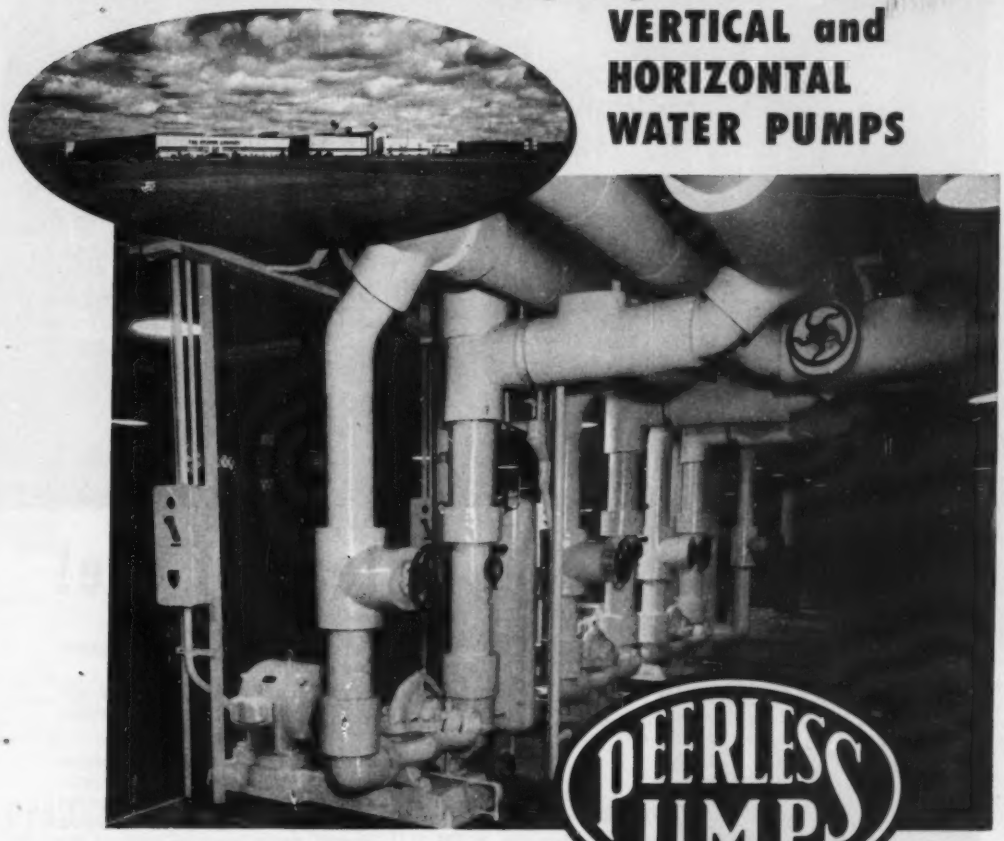
continuously rolled twice around laterally into a tube of uniform thickness, and

passed through a furnace. Bonding metal fuses with basic metal, presto—

Bundyweld . . . double-walled and brazed through 360° of wall contact.

NOTE the exclusive patented Bundyweld beveled edge, which affords a smoother joint, absence of bead and less chance for any leakage.

2,800,000 CFM Air Conditioning System at The Upjohn Company uses PEERLESS VERTICAL and HORIZONTAL WATER PUMPS



PEERLESS PUMPS SUPPLY AND CIRCULATE ALL WATER TO SYSTEM FOR BOTH HEATING AND COOLING

In one of the country's largest air-conditioning systems, Peerless vertical pumps supply all the well water necessary for 2,800,000 CFM system in The Upjohn Company's new pharmaceutical plant near Kalamazoo, Michigan. In addition, all hot and cold water circulated within the plant for the huge air-conditioning system is pumped by Peerless Type A general purpose horizontal centrifugal pumps. A 100% Peerless raw water supply and circulating pumping system for air-conditioning, such as was selected by The Upjohn Company and their engineers and builders, The Austin Company, provides an efficient and dependable water pumping system for industrial and commercial structures. Write today for information and helpful bulletins that explain the application of both vertical and horizontal Peerless pumps to your water supply and handling requirements.

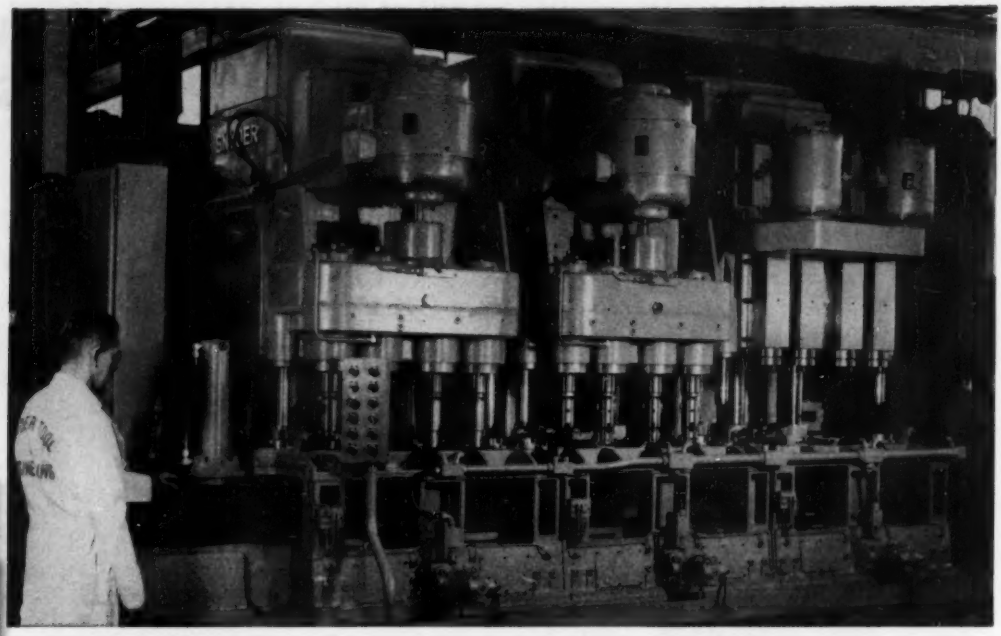
ON THE JOB!

Inset Photo: Exterior of The Upjohn Company's new pharmaceutical plant near Kalamazoo, Michigan. Total refrigeration load for air-conditioning systems is 4,000 tons. Raw water is supplied at 54°F from deep wells by Peerless vertical turbine pumps.

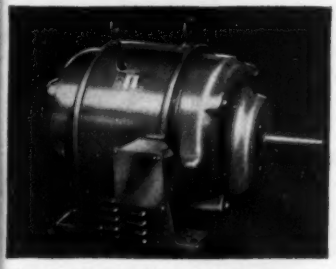
Large Photo: One of several banks of 3 Peerless Type A pumps which deliver water to refrigeration compressors, as well as to roof sprays and cooling coils. Others handle circulation to hot water converters for heating in winter time. Peerless has furnished a total of 52 pumps in The Upjohn Company's plant.

PEERLESS PUMP DIVISION
FOOD MACHINERY AND CHEMICAL CORPORATION

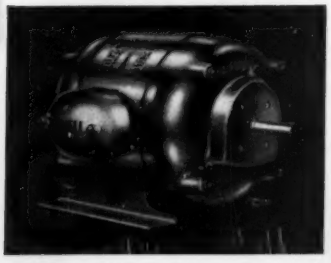
Address inquiries to Factories at:
Los Angeles 31, Calif. and Indianapolis 8, Ind.
Offices: New York, Atlanta, Fresno, Los Angeles, Chicago, St. Louis, Phoenix, Dallas, Plainview and Lubbock, Texas; Albuquerque, New Mexico.



Three jobs done, instead of one!



Howell Type F Motor. A high slip, high torque motor designed for punching and boring operations. Sizes ½ to 200 H.P. in open frames; ½ to 125 H.P. in enclosed frames.



Howell Type SC, general purpose, protected-type Motor. Ideal for driving machines and equipment where atmosphere is moisture- or dust-free. Horizontal or vertical mounting.

This 7 station transfer-type boring machine was designed and built to replace *three* machines!

It rough bores, semi-finish bores and finish bores cylinder sleeves to exacting tolerances in one continuous, automatic operation.

Howell engineers worked closely with this manufacturer to provide the right type and size motor for each application. Two 15 H.P. and two 5 H.P. Howell Industrial Motors supply dependable power for the twelve boring spindles. A 7½ H.P. Howell motor operates each of the three hydraulic pumps which control the rough, semi-finish and finish heads. Each motor was engineered for its job!

This is a typical example of the service Howell offers you. We will work with you, both in your plant and at Howell, to design precision-built, quality motors for your jobs.

Our research facilities, engineering experience and manufacturing skill are at your service. May we help you?

HOWELL ELECTRIC MOTORS COMPANY
Howell, Michigan

OWELL
Red Band
MOTORS

HOWELL ELECTRIC MOTORS CO., HOWELL, MICH.
Precision-built industrial motors since 1915

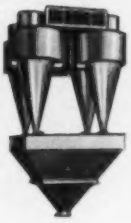
American Blower—a time-honored name in air handling

Venturafin Unit Heaters

Mechanical Draft Fans

Utility Sets

Ventura Ventilating Fans

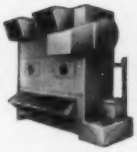


Dust Collectors

Air Washers

Industrial Fans

Heating and Cooling Coils



Air Conditioning Equipment

Look before you buy. There's a big difference in quality, design, quietness, operating costs and efficiency between American Blower and other air handling equipment. Comparison tests prove the superiority of American Blower products.

In Kansas City, Mo., as in other cities, American Blower Air Handling Products serve commerce, industry and public utilities. For air handling data in the Kansas City area, call American Blower—Victor 7181. Elsewhere, consult your phone book.

Product of the month

American Blower Gas-Fired Unit Heater, built in 7 sizes, capacities from 70,000 to 230,000 BTU per hour input. Write for Bulletin 7117.

Now you can buy American Blower Gas-Fired Unit Heaters

American Blower, pioneer of lightweight unit heaters for steam and hot water systems, offers a complete line of self-contained gas-fired models for a wide range of industrial and commercial applications.

Check these quality features: sturdy steel casing, with baked-enamel finish, bonderized against rust; operates with manufactured, mixed, natural or liquefied petroleum gases; aluminized steel combustion chamber to withstand high temperatures and resist corrosion; quiet, efficient operation; A.G.A.-approved.

Your heating supply house carries a complete line of American Blower Gas-Fired Unit Heaters in sizes and capacities to meet your requirements. If they cannot supply you, call the nearest American Blower Branch Office.

AMERICAN BLOWER CORPORATION, DETROIT 32, MICHIGAN
CANADIAN SIROCCO COMPANY, LTD., WINDSOR, ONTARIO

Division of American Radiator & Standard Sanitary Corporation

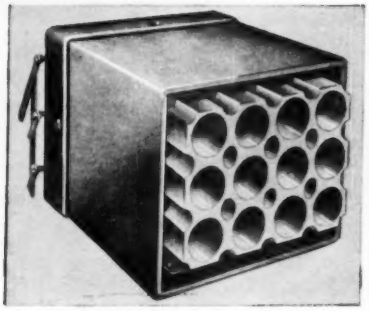
YOUR BEST BUY AMERICAN BLOWER AIR HANDLING EQUIPMENT

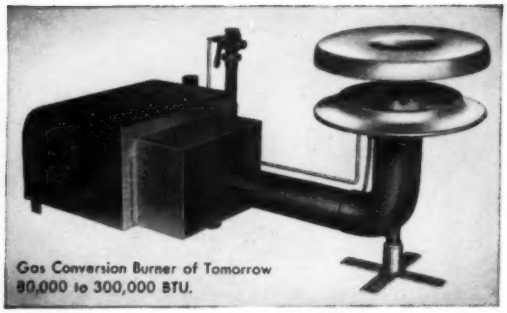
Serving home and industry

AMERICAN-STANDARD · AMERICAN BLOWER · CHURCH SEATS · DETROIT LUBRICATOR · KEWANEE BOILERS · ROSS HEATER · TONAWANDA IRON

TRULIRADIANT

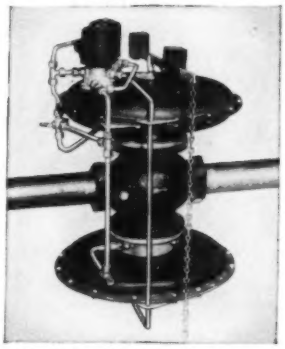
DELUXE BURNERS and CONTROLS FOR EVERY JOB





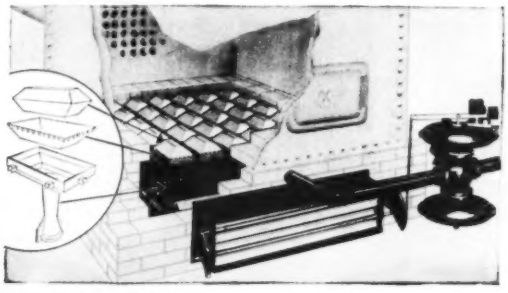
Gas Conversion Burner of Tomorrow
80,000 to 300,000 BTU.

Horizontal Gas Burner (above) for some types of commercial and industrial installations. Oil standby can be built into burner. Capacity unlimited.



Demandtrol Hi-Low Gas Valve is an electrically controlled gas operated diaphragm valve for use on gas-fired boiler and furnace installations. It features automatic control of the gas and air supply to the burners. With Demandtrol on the job, your gas burner will always operate at its most efficient stage . . . at "High fire" for peak demands, and thrifty "Low fire" when demands are less. Demandtrol prevents excessive feeding of gas to a cold boiler, by restricting fuel flow until furnace temperature and stack draft are established.

TRULIRADIANT Gas Burner (lower right) provides peak combustion efficiency in boilers and furnaces. Features include short, silent interlaced 45° flame, clog-proof burner ports and venturi, "emerald-shape" insulfractories and integral-pilot burners. The Burner is adaptable to all sizes and types of installations. Capacity unlimited.



The special Air Louver Box, complete with "Fail Safe" feature, provides the proper proportion of secondary air for peak combustion efficiency.

Some territories still open.
Write for information.

SULLIVAN

VALVE & ENGINEERING CO.

30 North LaSalle Street, Chicago 2, Illinois
1400 East Second Street, Butte, Montana
4124 Long Beach Avenue, E., Los Angeles 58, Calif.

Facts about copper's economy

COPPER'S quality can cost less...and low bid proves it

Prefabricating a stack of 3" ANACONDA Type M Copper Tube. Note split-ring torch used by Mr. Willig for soldering joints.

One man can lift this 3" lightweight, prefabricated stack of ANACONDA Type M Copper Tube.

The long performance and owner satisfaction are not the only advantages that copper gives. Prefabrication and ease of installing copper tube assemblies actually cut construction costs.

Mr. C. Willig, of Buffalo, N. Y., is another contractor who proved this point last year on a 50-home, low-cost housing development. His bid on an all-copper plumbing job—water service, and all water, waste and vent lines—was low by $15 per house and 10% lower than for ferrous pipe.

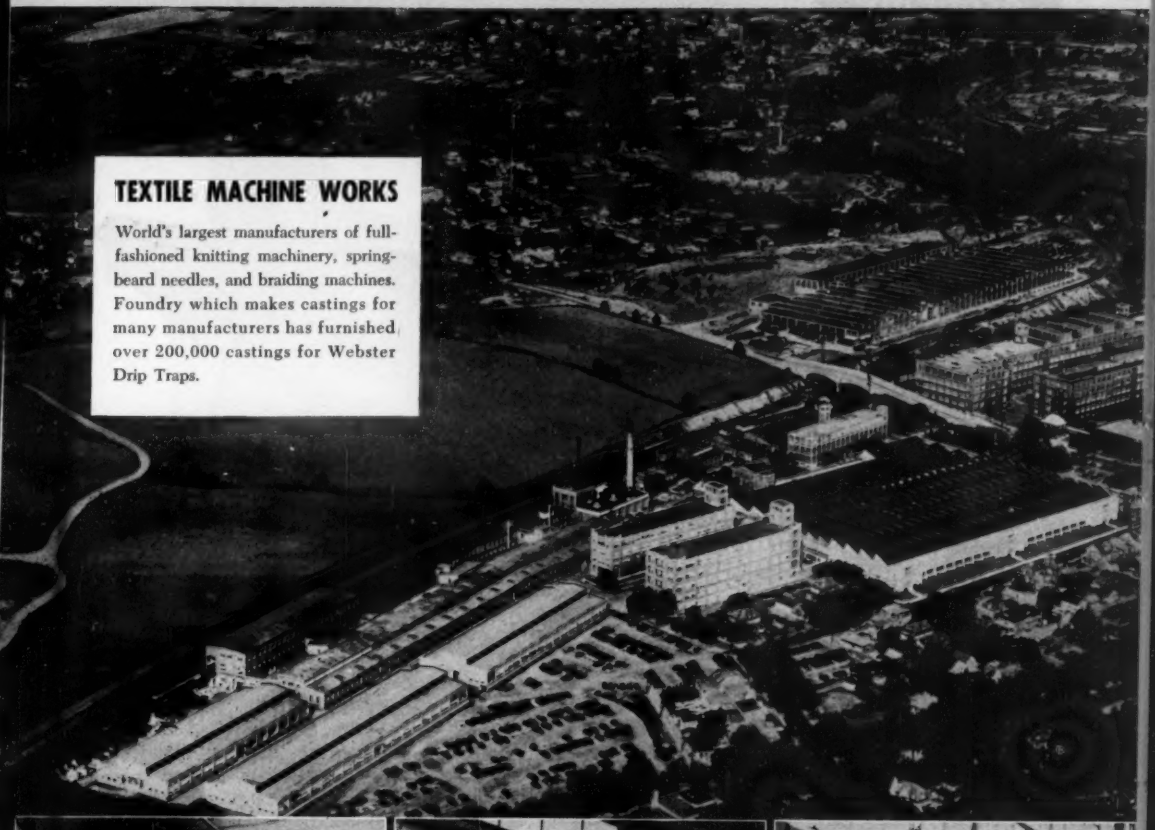
And Mr. Willig maintained his profit because copper cut his labor costs so low. He knew he could rough in 3 or 4 times faster with copper tube and soldered fittings than with heavy pipe and threaded or caulked connections.

Shop fabrication of rough-in sections, ease of making solder-type connections and use of standard 20′ lengths for long runs are the big and immediate cost-saving features of ANACONDA Copper Tube installations. Long life and trouble-free service are continuing dividends that only copper pays so well. The American Brass Company, Waterbury 20, Conn. In Canada: Anaconda American Brass Ltd., New Toronto, Ontario.

8230

nothing serves like **ANACONDA®** **COPPER TUBES**

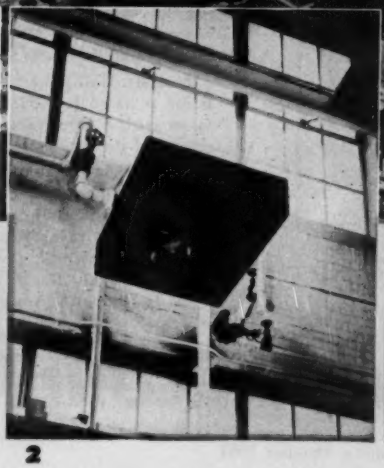
51 Years of



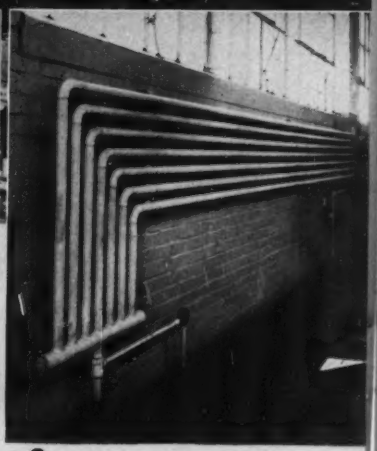
TEXTILE MACHINE WORKS

World's largest manufacturers of full-fashioned knitting machinery, spring-beard needles, and braiding machines. Foundry which makes castings for many manufacturers has furnished over 200,000 castings for Webster Drip Traps.

1



2



3

Industrial Growth

Competent Management, Continuous Plant Expansion, and 51 Years a Webster Customer

Plant expansion is practically continuous at the famed Textile Machine Works in Reading, Pa. On August 29, 1900, Textile Machine Works bought their first Webster Steam Heating Equipment. Today the entire plant is Webster-equipped, old buildings as well as new.

Heating comfort is provided for approximately 4,000 employees in buildings that total 1,275,000 square feet of floor space.

Webster Thermostatic Traps are used on all radiators and unit heaters. Webster Dirt Strainers give protection for traps draining unit heaters and process equipment.

Pipe coils, still in service in older sections, have given way to Webster Walvector in new office sections. Webster Walvector spreads the heat evenly along outside walls. Heating requirements in certain new plant sections are met with Webster-Nesbitt Unit Heaters.

An annual heating check-up is standard procedure at Textile Machine Works. Taking one building at a time, the maintenance crew checks every item of heating equipment and replaces inoperative units.

Webster service to Textile Machine Works is provided by Harry Doerrfuss, 28 years with Webster, of Webster's Philadelphia Office. There is a Webster Representative near you.

Address Dept. HP-10

WARREN WEBSTER & COMPANY

Camden 5, New Jersey : : Representatives in Principal Cities

In Canada, Darling Brothers, Limited, Montreal

Webster HEATING

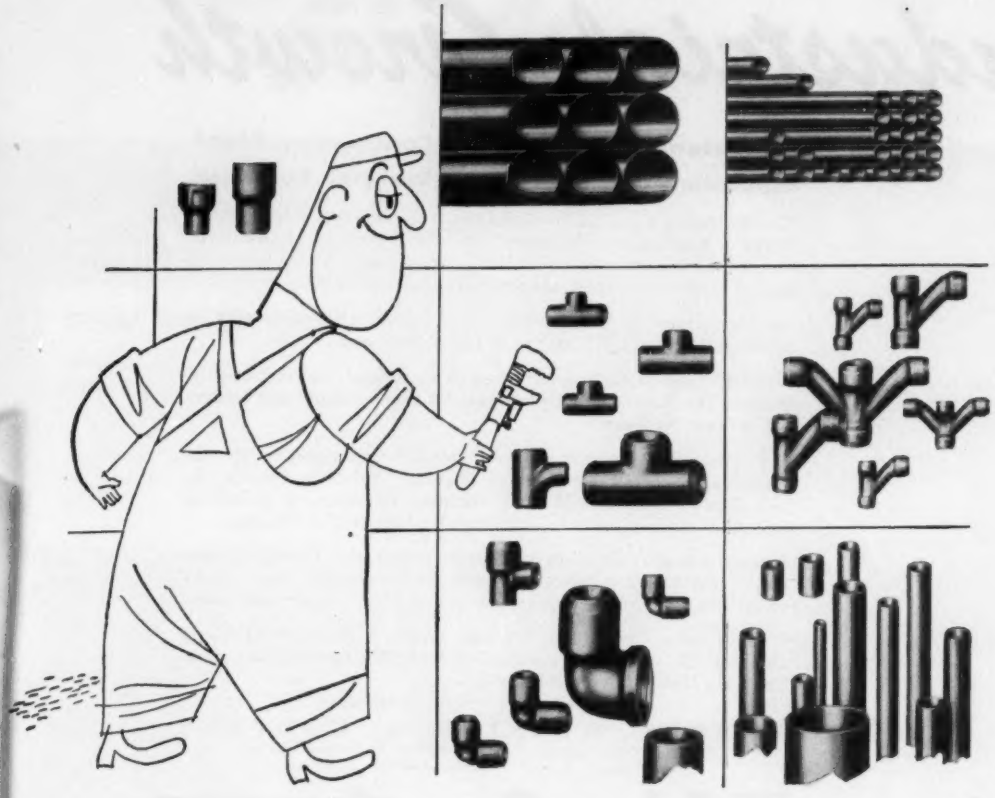
1 Webster-Nesbitt Propeller-Fan Unit Heater in new power house, with Webster Drip Trap and Strainer.

2 Webster-Nesbitt Down-Blow Unit Heater in new erecting shop, with Webster Drip Trap and Strainer.

3 Webster Thermostatic Trap on pipe coil radiation in machine shop. Pipe coils were used regularly by Textile Machine Works prior to the development of Webster Walvector. Typical coil, illustrated, spread over about 26 feet of wall space, to a height of about 3 feet and provided a heat output of slightly over 100 sq. ft. of EDR. It required more than 400 lbs. of steel pipe.

4 Webster Walvector in new power house. The unit illustrated spreads the heat over about 11 lineal feet of wall space, can be installed in as little as 17 inches of height and produces just about the same heat output as the coil. Total weight of materials required is less than 15% of the weight of the pipe coils.

PIPE DREAM . . . 1951



Since the available supply of copper for non-defense work has become so limited, there just isn't a great deal we, or anyone else can do, these days, to fill your wants for MUELLER BRASS STREAMLINE copper tubing. We can say only this, for certain . . .

We can fill your orders for most STREAMLINE fittings.

We will not cut down quality of STREAMLINE fittings or tube regardless of material shortages.

We will do our best to help you solve any installation problem you ask us about.

As soon as copper becomes more plentiful we will be the first to see that you get the tubing and fittings you want. You can then make the kind of home, commercial and industrial STREAMLINE copper installations you know are the finest money can buy.

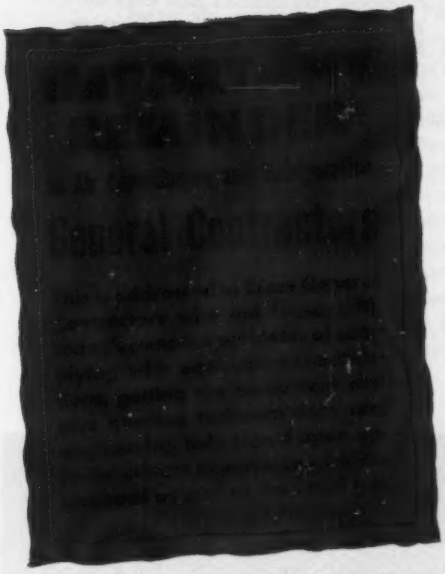
68

See your jobber for further information or write for catalogs S-351 and W-251 describing our complete line of STREAMLINE *wrought copper and cast bronze fittings.*

MUELLER BRASS CO. STREAMLINE PRODUCTS

MUELLER BRASS CO. PORT HURON 1, MICHIGAN

BRUNNER
SINCE 1906



BRUNNER offers YOU Air Conditioning and Refrigeration Condensing Units up to 75 tons capacity, incorporating design features providing maximum adaptability to specific application requirements.

BRUNNER offers YOU an experienced engineering staff qualified to assist in working out problems of selection, installation and operation.

BRUNNER offers YOU plant capacity and manufacturing flexibility enabling you to meet delivery as well as equipment specifications.

BRUNNER offers YOU not only a complete range of dependable equipment but a well known, highly respected organization working hand in glove *for* you toward the satisfying and profitable fulfillment of your contracts.

BRUNNER MANUFACTURING COMPANY, UTICA 1, N. Y., U. S. A.

Write or phone us for a factory representative who can talk your language, from preparing bids to making the installation. No obligation.

REFRIGERATION CONDENSING UNITS
...a size and type for every purpose

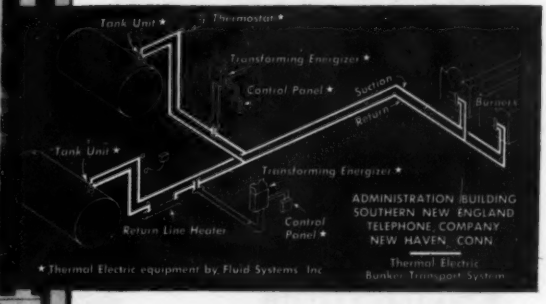
AIR AND WATER COOLED MODELS
¼ HP. to 75 HP.

BRUNNER
SINCE 1906

AIR CONDITIONING
Self Contained Units in 4 sizes: 3-5-7½ and 10 HP.
Remote Installation Types from 3 to 75 HP.

How 'Telephone' Solved the Bunker Problem

TELEPHONE companies have to be tough customers when it comes to oil burning equipment. They demand a plant which will give them heat at any time, even during the summer, for keeping delicate dial mechanisms dry. During hurricanes, blizzards, and other emergencies, the heating equipment cannot fail. ☆ The Bell Laboratories approved the Thermal Electric method for transporting heated bunker fuel in 1938. Since then, six leading Bell subsidiaries have installed it to solve the problem of swift and certain startups after shutdowns of any duration. ☆ The Southern New England Telephone Company has had thirteen years' experience with Thermal Electric. They have found it so successfully met their operating requirements that they've installed it in twenty of their buildings.



How It Works: The Transforming Energizers pass safe 20-volt current through the pipes that carry the fuel, generating heat at 100% efficiency. Thermostats and Control Panels regulate fuel temperature at 120°F., making system fully automatic. The Tank Units remove fuel from *unheated* underground storage tanks. Thermal Electric works with any burner. Southern New England Telephone uses it with Ray, York, Petro, and Johnson burners.

PAT. NO. 2,224,403 HPS-4

Thermal Electric Fluid Systems Inc.

Fluid Systems, Inc., 1881 Dixwell Ave., New Haven, Conn.

Please send without obligation "The Common Sense of Heavy Fuel Transport" plus Customer List of hundreds of users, including telephone companies.

*Name*_____

*Firm*_____

*Street*_____

*City*_____ *State*_____

☐ P.S. Send the proof about that three-year shutdown!

Thermal Electric and Fluid Systems, Inc. are trade marks registered in U.S. Pat. Off.

It starts at a flip of a switch! In one case, Thermal Electric started bunker flowing *immediately* after a *three-year* shutdown! Proof on request.

The Molasses System General Mills Forgot

Recently, we asked the management of General Mills' Buffalo, N. Y., plant how their Thermal Electric System was performing. They said, "Why, it must be okay — we've never paid any attention to it." All they knew was that they always had molasses flowing from their pipes at exactly the right temperature whenever they wanted it. General Mills had practically forgotten the system which pipes their molasses up seven stories at a constant 110°F. for making Betty Crocker GingerCake and Cooky Mix — and it has been in operation for over four years! What better proof could we give you to support Thermal Electric's *guarantee* of PERFECT PERFORMANCE — NO MAINTENANCE. We believe that the General Mills installation, the one the management forgot, is ample demonstration of Thermal Electric's success in handling viscous fluids. What is your fluid problem?

Thermal Electric System for molasses (or *any* fluid transport): Low-voltage current from the Transforming Energizer passes through the pipe walls, maintaining fluid contents at 110°F. and 100% efficiency. Thermal Electric also handles "touchy" fluids at various temperatures for many other leading food manufacturers. Send in for our customer list.

★Thermal Electric equipment by Fluid Systems

Consult Fluid Systems, Inc. for specialized engineering aid in designing heated pipe transport of process fluids.

PAT. NO. 2,534,403

HPI-4

Thermal Electric

Fluid Systems, Inc., 1881 Dixwell Ave., New Haven, Conn.

Please send without obligation "Simplified Industrial Fluid Transport Cuts Costs" and Customer List.

*Name*_____ *Position*_____

*Firm*_____

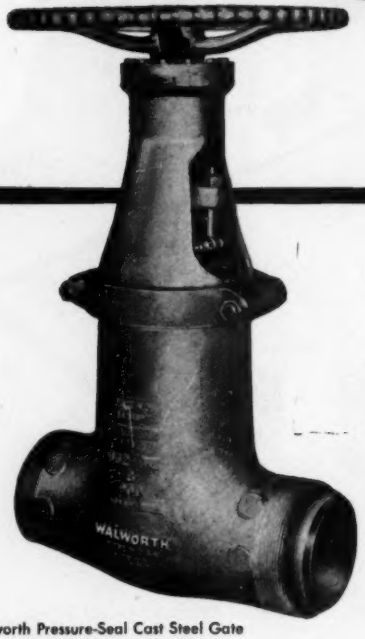
*Address*_____

*City*_____ *State*_____

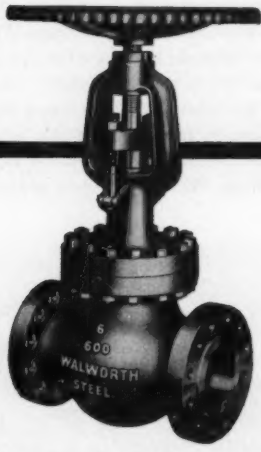
Thermal Electric and Fluid Systems, Inc. are trade marks reg. in U.S. Pat. Off.

Walworth Series 150 Cast Steel Valves are tough and wear-resistant. Gate valves are available in sizes from 2" to 24", and globe valves in sizes 2" to 12".

Years of trouble-free service assured with . . .



Walworth Pressure-Seal Cast Steel Gate Valves exemplify the greatest improvement in high-pressure, high-temperature valve design. The internal pressure keeps the body-to-bonnet joint tight. Series 600: 1½" and larger — Series 900: 3" and larger — Series 1500: 1" and larger.



Walworth Series 600 Cast Steel Valves have strength and ability to resist wear. They assure long life and positive operation. Available in either gate or globe types — Gate: sizes 1½" to 18" — Globe: sizes 2" - 8".

WALWORTH cast steel valves

Walworth Cast Steel Valves have proved their ability to assure years of trouble-free, dependable service. Accurately threaded stems, deep stuffing boxes, streamlined ports, and heavy cast alloy steel walls are their top features.

You can get full information about Walworth's complete line of steel, iron, and bronze valves and fittings from our new Catalog 47. See your nearest Walworth distributor, or write on business stationery for your free copy.

Walworth Cast Steel Fittings are manufactured in a wide range of types and sizes to meet every requirement. They are made to the highest standards of quality, both as to dimensional accuracy and metallurgical properties.

WALWORTH
valves and fittings
60 EAST 42nd STREET, NEW YORK 17, N. Y.

You Can Always Get Service on Allis-Chalmers Motors

ALABAMA
Birmingham—Elec. Repair & Serv. Co.
Montgomery—Standard Electric Co.

ARIZONA
Bisbee—Copper Electric Co. Inc.
Phoenix—Daley Electric Company

CALIFORNIA
San Diego—Calif. Elec. Works
Los Angeles—Larsen-Hague Elec. Co.
Oakland—T. L. Rosenberg Co.
San Francisco—Waldenthal-Gastiner

COLORADO
Denver—Baker Electric Company

CONNECTICUT
Hartford—Charles H. Leppert
Waterbury—Elec. Motor Repair Co.

FLORIDA
Jacksonville—Turner Electric Works
Miami—Peninsular Armature Works
Tampa—Tampa Armature Works

GEORGIA
Albany—Georgia Electric Co.
Atlanta—Bearden-Thompson Elec. Co.
Columbus—Smith-Gray Electric Co.

ILLINOIS
Chicago—Chicago Electric Co.
Marion—Giles Armature & Elec. Wks.
Mt. Vernon—Dawzer Electric

INDIANA
Indianapolis—Scherer Electric Co.
Evansville—Evansville Elec. & Mfg. Co.

IOWA
Sioux City—Smith Elec. & Supply Co.

KANSAS
Salina—Cent. Kans. Elec. Mach. Co.
Wichita—Tarrant Electric Mach. Co.

LOUISIANA
New Orleans—Industrial Elec., Inc.
Shreveport—Shreveport Arm. & Elec.

MAINE
Brewer—Stanley J. Leen Co.

MARYLAND
Baltimore—Keystone Electric Co.

MASSACHUSETTS
Lawrence—Roland B. Glines Co.
Roslindale—Ranney Electric Motors
Springfield—Elec. Motor Repair Co.

MICHIGAN
Detroit—Stecker Electric Company
Grand Rapids—Grand Rapids Ind. Elec.
Saginaw—Banning Elect. Prod. Corp.

MINNESOTA
Duluth—Mielke Electric Works
Minneapolis—Parsons Elec. Co.

MISSISSIPPI
Vicksburg—Ludke Electric Co., Inc.

MISSOURI
Kansas City—Boese-Hilburn Elec. Co.
St. Louis—French-Gerleman Elec. Co.
Springfield—Springfield Elec. Serv.

NEBRASKA
Omaha—Omaha Electrical Works

NEW HAMPSHIRE
Concord—A. S. Tracy

NEW JERSEY
Atlantic City—Charles A. Buckley
Paterson—Elec. Service Repair Co.
Trenton—Lockwood Elec. Motor Serv

NEW MEXICO
Albuquerque—Powell Electric Co.

NEW YORK
Buffalo—Robertson Electric Co.
Jamestown—A. E. Westburgh
Mt. Vernon—H. A. Schrack, Inc.
New York—Consol. Elec. Motor Co.
Rochester—Vanderlinde Elec. Corp.
Utica—Mather, Evans & Diehl Co.
Watertown—Watertown Elec., Inc.

NORTH CAROLINA
Charlotte—Southern Elec. Service Co.
Greensboro—Southern Elec. Serv. Co.
Rocky Mount—Hammond Elec. Co.

NORTH DAKOTA
Fargo—Minnkota Electric Serv. Co.

OHIO
Cincinnati—Cincinnati Elec. Equip. Electric Service Co.
Akron—A-C Supply Co.
Toledo—Romanoff Elec. Motor Serv.
Youngstown—Winkle Electric Co.

OKLAHOMA
Miami—Miami Armature Works
Oklahoma City—Southwest Elec. Co.
Tulsa—Smith-Milligan Electric Co.

OREGON
Eugene—Kaien Electric & Mach. Co.
Portland—Milwaukee Mach. Co.

PENNSYLVANIA
Johnstown—Universal Elec. Mfg. Co.
Osceola Mills—Mid-State Elec. Eng. Co.
Philadelphia—Elec. App. & Repair Co.
Pittsburgh—Penn. Elec. Coil Corp.
York—Industrial Electric Company

SOUTH CAROLINA
Greenville—Southern Elec. Serv. Co.
Spartanburg—Southern Elec. Serv. Co.

SOUTH DAKOTA
Sioux Falls—Electric Motor Repair

TENNESSEE
Columbia—Middle Tenn. Arm. Wks.
LaFollette—Standard Arm. Works
Memphis—Indus. Elec. & Supply Co.

TEXAS
Amarillo—G. E. Jones Elec. Co.
Beaumont—Elec. Mach. & Repair
Dallas—Industrial Elec. Equipment Co.
El Paso—B & M Machinery Co.
Fort Worth—Central Electric Co.
Houston—Ray A. Berents Co.

UTAH
Salt Lake City—Diamond Electric

VIRGINIA
Richmond—Wingfield & Hundley
Roanoke—Virginia Armature Co.

WASHINGTON
Spokane—Lee F. Austin Company

WEST VIRGINIA
Charleston—Charleston Elec. Supply
Fairmont—Central Elec. Repair Co.

WISCONSIN
Green Bay—Boemster Electric Co.
Milwaukee—Dietz Electric Co.
Wausau—Electric Motor Service
Wisconsin Rapids—Staub's Elec. Wks.

95 CERTIFIED SERVICE SHOPS COVER EVERY INDUSTRIAL AREA FROM COAST TO COAST

WHEREVER YOU ARE you can depend on convenient, competent, economical service on your Allis-Chalmers motors from an Allis-Chalmers Certified Service Shop.

These Certified Service Shops have met rigid Allis-Chalmers standards for experience, ability, equipment and business integrity. You can depend on them to use factory approved methods and parts and to do your work promptly at a fair price.

Tear out this ad and save it, or write the name of the Allis-Chalmers Certified Service Shop nearest you in your address book. And next time you need a motor, remember that service is important and Allis-Chalmers gives you service wherever you are. (Of course, Allis-Chalmers Certified Service Shops will give you good service on any of your electrical equipment, regardless of make.) Allis-Chalmers, Milwaukee 1, Wis.

A-34.72

Sold . . .
Applied . . .
Serviced . . .

by Allis-Chalmers Authorized Dealers, Certified Service Shops and Sales Offices throughout the country.

CONTROL — Manual, magnetic and combination starters; push button stations and components for complete control systems.

TEXROPE — Belts in all sizes and sections, standard and *Vari-Pitch* sheaves, speed changers.

PUMPS — Integral motor and coupled types from ¾ in. to 72 in. discharge and up.

Texrope, and Vari-Pitch are Allis-Chalmers Trademarks.

ALLIS-CHALMERS

More Scrap! More Steel!!

AMERICA expects the steel industry to produce more steel this year. More steel requires additional scrap. Steelmakers need the help of all steel users to get every possible extra pound of scrap to meet the nation's call for more steel production. We urge you to do your part. Turn in your scrap through your regular channels.

YOUR SCRAP IS NEEDED — YOUNGSTOWN

The Youngstown Sheet and Tube Company

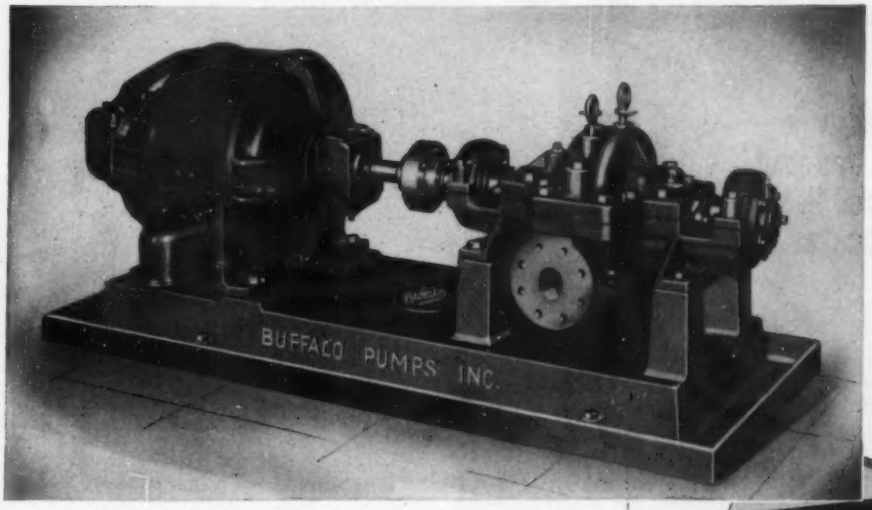
General Offices – Youngstown 1, Ohio

Export Offices – 500 Fifth Avenue, New York

MANUFACTURERS OF CARBON ALLOY AND YOLOY STEELS

The steel industry is using all its resources to produce more steel, but it needs your help and needs it now. Turn in your scrap, through your regular sources, at the earliest possible moment

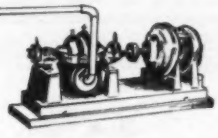
FOR HIGH PRESSURE CLEAR WATER PUMPING



"Buffalo" 2 STAGE AND 4 STAGE CLASS "RR" PUMPS

"Buffalo" Class "RR" Pumps are adequately built for the severe service of handling hot or chilled clear water at high heads, with exceptionally high efficiency. Practically no maintenance problem — modest power requirements — rugged endurance on the job — are what you get in "RR" Pumps. You will find all engineering details in BULLETIN 980-B. Write for your copy.

- Capacities Up To 900 gpm.
- For Heads Up To 1500′
- For Clear Water, Any Temperature



"Buffalo" PUMPS

BUFFALO PUMPS INC.

171 MORTIMER ST. BUFFALO, NEW YORK

Canada Pumps, Ltd., Kitchener, Ont.
Branch Offices in all Principal Cities

A BETTER CENTRIFUGAL PUMP FOR EVERY LIQUID

NOW'S THE TIME TO "TIE IN" WITH

SHAFCONAIRE*

* formerly known as SHAFCO

Leader in the Overhead Oil-Fired Heating Market

That's right, Heating Men! There's no time like now . . . *right now* to get set with SHAFCONAIRE OverHead Heaters. They're big business boosters, extra profit producers. For SHAFCONAIRE, you know, is the original suspended oil-fired furnace known for years as SHAFCO. It's quality-built from end to end . . . designed especially for use in commercial and industrial buildings. Not just a domestic floor-type unit tilted horizontally on its side. And SHAFCONAIRE has been time-tested, thoroughly proved in use . . . the only furnace of its type backed by over 12 years actual operation in the field.

MODELS from 100,000 to 405,000 B.T.U. for single or multiple unit installation to meet a wide range of commercial and industrial heating requirements.

OVERHEAD HEATERS, INC.

(formerly SHAFCO Distributing Corporation)

1354 BOOK BUILDING • DETROIT 26, MICHIGAN

And here's something to talk about

4 ESSENTIAL FEATURES FOUND ONLY IN SHAFCONAIRE

1. BUILT-IN PLENUM CHAMBER—An exclusive patented feature that saves you plenty of time, trouble, and guess-work in making installations. Assures uniformly heated warm air output, eliminates on-the-job sizing and extra sheet metal work. Just top off ducts from end, top or both sides to meet installation requirements.

2. HEAVY DUTY CONSTRUCTION—Use of heavy-gauge welded boiler plate assures long-life, trouble-free operation. No warping, no buckling, no burn-outs common to stamped steel construction.

3. INTERMEDIATE HEAT-TRAVEL SECTION—Patented intermediate chamber between refractory-lined firebox and heavy gauge heat exchangers serves to spread flame and eliminate impingement on metal. Permits expansion of hot gases, improves operating efficiency.

4. EFFICIENCY ENGINEERED HEAT EXCHANGER—Alternately spaced baffle plates in each of the heat exchanger sections effectively retard the flow of hot gases toward stack connection, permit maximum transfer of heat.

OVERHEAD HEATERS, INC.
1354 BOOK BUILDING • DETROIT 26, MICHIGAN

Please send me complete information and Price Lists on SHAFCONAIRE (formerly SHAFCO) OverHead Heaters.

*Name*_____

*Company*_____

*Address*_____

*City*_____ *Zone*_____ *State*_____

DON'T DELAY!
SEND COUPON TODAY!

You'll get complete details and price information on the "hottest" bet for extra profits in the present heating market.

Your welders will seem like *Siamese Twins*

When they use Midwest Welding Fittings, your welders will turn out so much more work that they'll seem like Siamese Twins. The reason? . . . The exceptional accuracy and uniformity of Midwest Welding Fittings enable your welders to spend more time welding and less time in preparation.

MIDWEST WELDING FITTINGS IMPROVE PIPING DESIGNS AND REDUCE COSTS

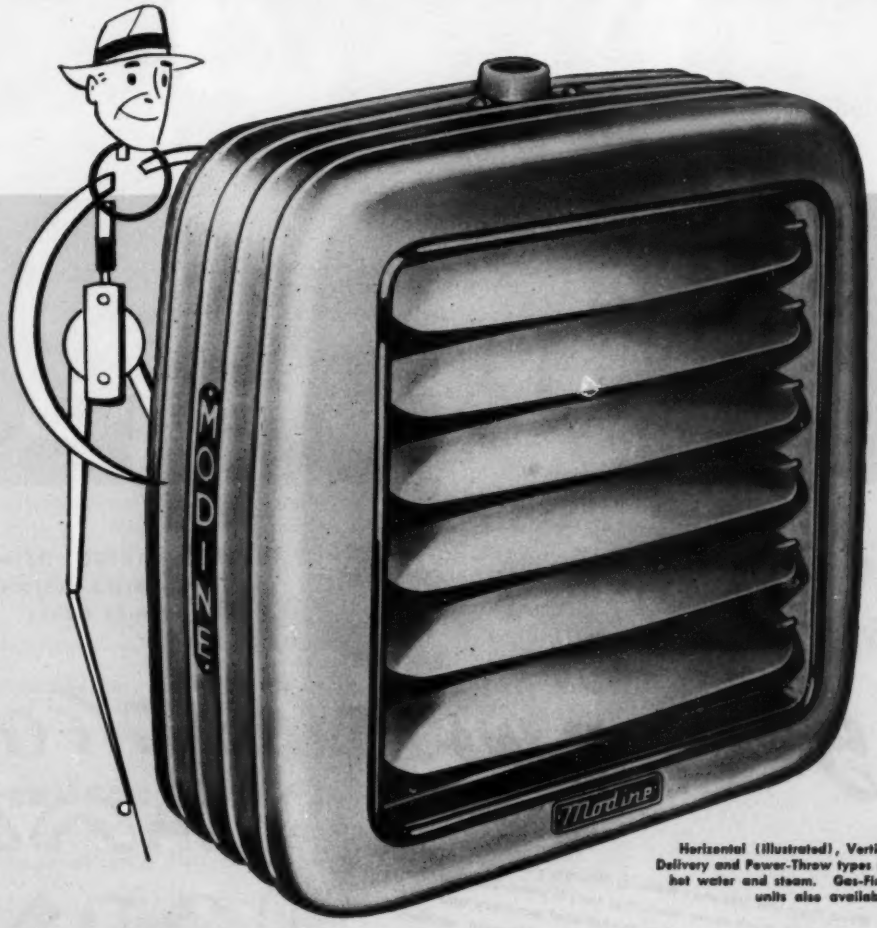
MIDWEST
PIPING & SUPPLY CO., Inc.

Main Office: 1460 South Second Street, St. Louis 4, Mo.
Plants: St. Louis, Passaic, Los Angeles and Boston
Sales Offices: New York 7—30 Church St. • Chicago 3—79 West Monroe St.
Los Angeles 33—329 Anderson St. • Houston 3—1213 Capitol Ave.
Tulsa 3—224 Wright Bldg. • Boston 27—426 First St.

STOCKING DISTRIBUTORS IN PRINCIPAL CITIES

COMPARE

. . . ON EVERY COUNT MODINE UNIT HEATERS STAND OUT



Horizontal (Illustrated), Vertical Delivery and Power-Throw types for hot water and steam. Gas-Fired units also available.

Modine UNIT HEATERS

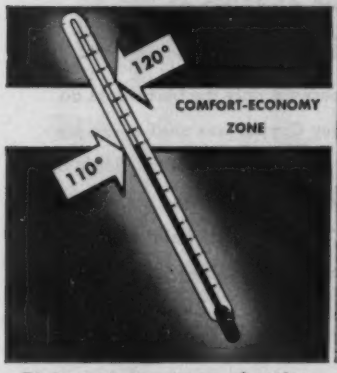
U-1123

Advanced engineering . . . superb styling . . . highest grade materials and craftsmanship—all quality hallmarks of Modine Unit Heaters. They're your assurance of *heating performance at its best* — high fuel economy . . . years of trouble-free service. Built to a standard of excellence — Modine is the choice for unfailing dependability, lower operating and maintenance costs. So whether you need Horizontal Delivery models (illustrated), Verticals or Power-Throws — *compare first!* Modine Mfg. Co., 1509 DeKoven Ave., Racine, Wis.

ENGINEERS RATE MODINE THE STANDARD OF EXCELLENCE

Write for Bulletin 149-A, "Modine Unit Heating." Or contact your Modine representative listed in your phone book classified section.

Six of many outstanding features that account for the Modine quality reputation



Discharge air temperatures of 110° to 120° F. are correctly related to air velocities — assure perfect heating comfort plus lower fuel costs.

Sturdy, steel, integral fan guard offers safety from exposed fan — serves as a resilient, vibration-absorbing mounting for the unit's motor.

Built-in velocity generator effectively steps up heat throw. This assures positive heat penetration of the cold air strata that is near the floor.

Direct-from-pipe suspension is safe and economical, with no hanger-rods. Heated air stream may be easily redirected over full 360° range.

Sound-silencing features assure quieter operation — certified by accurate laboratory sound ratings. Especially important for commercial and institutional use.

Parker-Bonderizing provides rust-resistance for casings and other sheetmetal parts — anchors paint to steel — preserves the fine finish longer.

When *Lifetime Service* is the object—

IT'S **HUSSEY COPPER** *Every Time!*

THE HOUSE OF REPRESENTATIVES

Protected for Life

with 45 TONS of

HUSSEY COPPER

Selected because only the best would do, Hussey Copper was used to replace the entire roof area of the House of Representatives wing at the U. S. Capitol. Easiest of all to fabricate and install, Hussey Copper gives a lifetime of beauty and trouble-free service.

House of Representatives, U. S. Capitol

THE FINGLES COMPANY of Baltimore, now established more than half a century, were the Sheet Metal Fabricators on this important installation.

HUSSEY

C. G. HUSSEY & COMPANY

(Division of Copper Range Co.)

ROLLING MILLS AND GENERAL OFFICES · PITTSBURGH 19, PA.

Warehouse Stocks in:

PITTSBURGH CLEVELAND NEW YORK CHICAGO

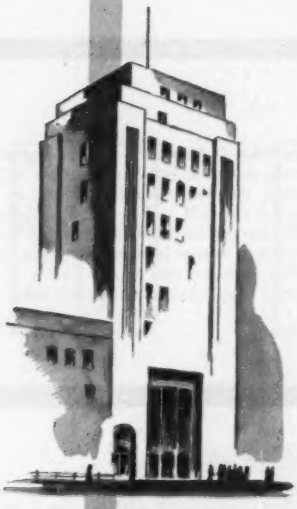
ST. LOUIS PHILADELPHIA CINCINNATI

BARBER COLMAN

ZONE CONTROLS

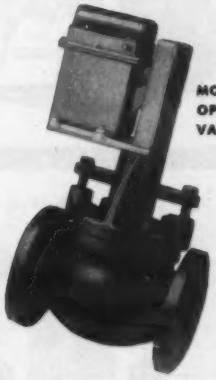
Save

- **FUEL DOLLARS**
- **MAN HOURS**



ROOM THERMOSTAT

ECONOSTAT



MOTOR-OPERATED VALVE

ZONE CONTROL
for

OFFICE BUILDINGS
FACTORIES
STORES
APARTMENTS
HOTELS
RESIDENCES
SCHOOLS
CHURCH PROPERTY
PUBLIC BUILDINGS
WAREHOUSES

COMFORT • CONVENIENCE • ECONOMY

Barber-Colman equipment is adaptable to any steam or hot water heating system, and can be engineered for maximum performance in any kind or size of building.
Write for bulletin F 3718-1.

BARBER COLMAN

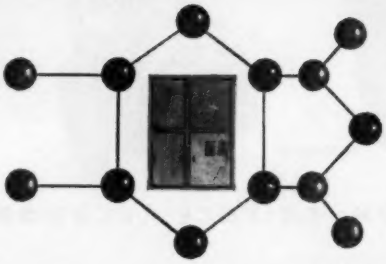
NATION-WIDE SALES AND ENGINEERING SERVICE

BARBER-COLMAN COMPANY
1228 ROCK STREET • ROCKFORD, ILLINOIS

Everybody who sells heating equipment should

People need a new kind of home. They need it because their way of living has changed ...but their houses (bound by convention) haven't. They're still pretty much the same as in Grandpa's day. They have new gadgets, new appliances. And, of course, central heating. But generally speaking, people today don't sleep any better, eat any better, or have less dirt in their houses than Grandma and Grandpa did in theirs.

They're living in Model T's. On the highway or on the job, most people are strictly 1951. But when they come home, they put on a theoretical celluloid collar. And their wives wear theoretical bustles as they swelter over their modern ranges in much the same way Grandma sweltered over her coal stove. Yes, the homes people live in shape their lives.

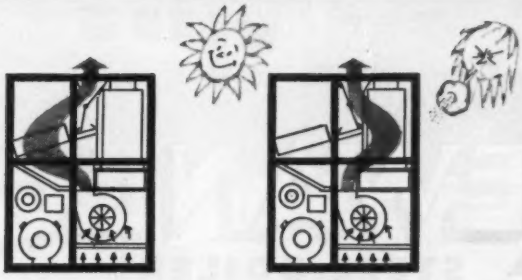


Today they need a "Comfort System." Central heating has changed houses somewhat. But, after all, it's a one-season proposition. On the other hand, the new Carrier "Comfort System" keeps you comfortable all year round. It's the new Carrier Weathermaker* Air Conditioner. Here's a single package you can sell that heats, cools, dehumidifies and circulates clean, filtered air.

Built around air conditioning. That's the idea of the Weathermaker Home. Free of climate and location restrictions, the Weathermaker Home can be designed and built as you want. When you sell the Carrier Weathermaker for such a home, you are selling a new way of living. And we're going to help you sell it.

read about the Carrier Weathermaker Home

First, we'll give you the facts on the equipment itself — the Carrier Weathermaker Air Conditioner. We'll tell you why it's far and away the finest year-round home comfort system available. We'll put the finest air conditioning background in the business at your disposal. And we're taking this story right to *your* customers, in a dozen national publications. So get the full story yourself...mail the coupon *today*.



Alternate air travel for heating and cooling is just one Carrier exclusive in the great new Weathermaker. It delivers the necessary *extra* air for cooling, and wastes no fan power. Other exclusives: high dehumidification; choice of return air and flue connections; burner and control assembly slides out for easy servicing; entire unit serviceable from one side.

Fits anywhere. Basement, attic, closet, utility room. Only 43" deep, 52" wide, 70" high. Ships in sections to go through 30" doorways easily. Capacities: 3 hp. or 5 hp. of cooling with 100,000 to 140,000 Btu's of heating, and 5 hp. of cooling with 150,000 to 190,000 Btu's of heating. For all types of gas. Available in 220 volt, single or 3 phase, 60 cycle current. And the new Carrier Weathermaker Air Conditioner can be used in many types of *commercial buildings*. That's another part of the Weathermaker story we're anxious to send you. Write for it today. **Reg. U. S. Pat. Off.*

Carrier

AIR CONDITIONING • HEATING • REFRIGERATION

Carrier Corporation, 307 South Geddes Street, Syracuse 1, New York

Send me the whole story on the new Carrier Weathermaker Home.

NAME_____

FIRM_____

STREET_____

CITY_____ STATE_____

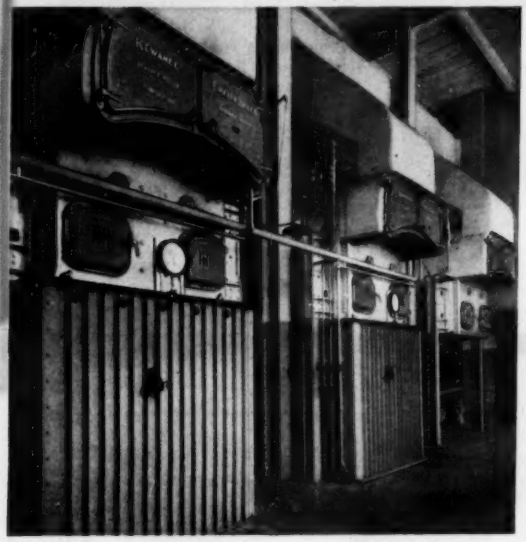
Where modern standards of heating match the pace of new teaching methods

VOCATIONAL TECHNICAL HIGH SCHOOL
Hammond, Indiana

Vocational training at its best! Embryo printers set type and run the presses . . . machinists operate lathes and drills . . . doing is added to theory.

L. CROSBY BERNARD, Hammond, *Architect*
LEO BESOZZI, Hammond, *Consulting Engineer*
FRANK S. BELLIS, Berwyn, Ill., *Heating Contractor*

KEWANEE
STEEL BOILERS



In this up-to-date boiler room a battery of 3 Kewanee Boilers for Oil Firing; operated at 15 lbs. wp; produce heat for 42,500 sq. ft. of steam radiation . . . *plus generous overloads*. They have a total rating of over 10 million Btu hourly.

The vocational high school at Hammond, Indiana is an outstanding example of the modern thinking which goes into the construction and equipment as well as the teaching methods of America's new schools.

Located in the midst of an important industrial area the pupils are taught basic trades by working at them in the class rooms. The building itself is the last word in modernity . . . functionally arranged, well lighted and ventilated and *heated with Kewanee Steel Boilers.*

Considering the advanced thinking which went into this fine structure, the logical choice of heating boilers was Kewanee. For, during 80 years devoted to designing and building boilers, Kewanee has kept pace with the ever increasing need for greater reliability and flexibility combined with economy in the use of fuel.

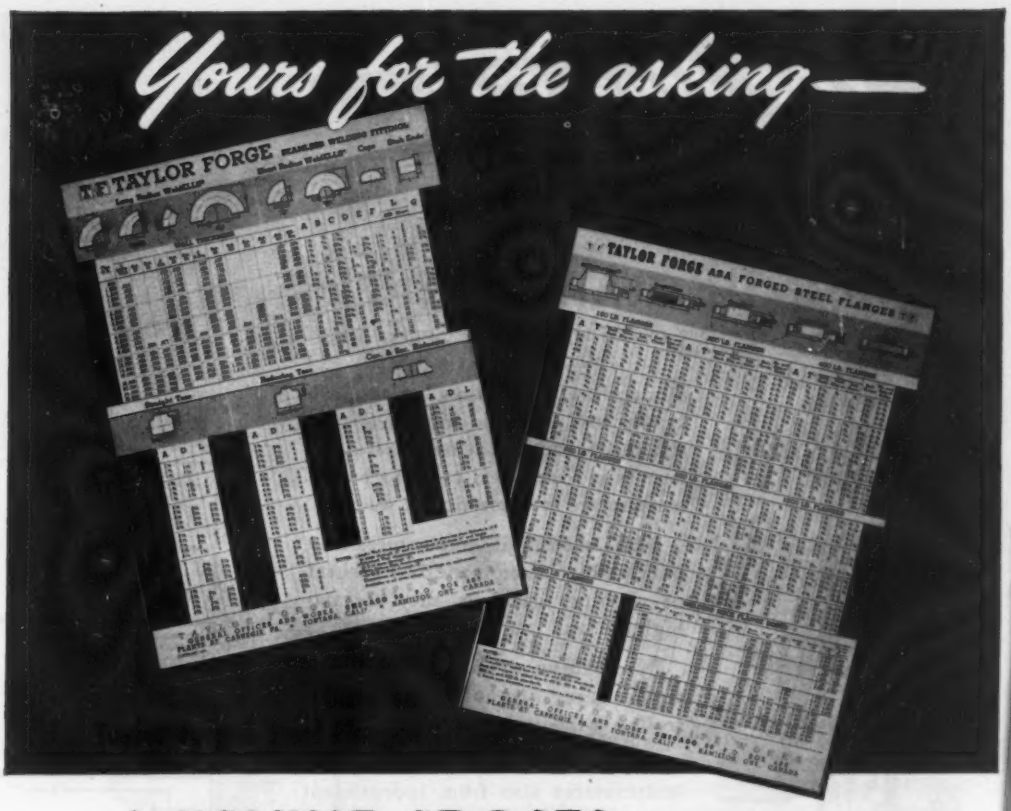
KEWANEE BOILER CORPORATION
KEWANEE, ILLINOIS
Eastern District Office: 40 West 40th Street, New York City 18
Division of American Radiator & Standard Sanitary Corporation

BUILDING BETTER BOILERS OVER 80 YEARS

Serving home and industry

AMERICAN STANDARD · AMERICAN BLOWER · CHURCH SEATS · DETROIT LUBRICATOR · KEWANEE BOILERS · ROSS HEATER · TONAWANDA IRON

Yours for the asking—



A VOLUME OF DATA

. . . covering welding fittings and forged steel flanges . . .

ON A SINGLE SHEET

Here is just about the handiest tool ever devised for the pipe designer. Data on welding fittings and flanges that otherwise could be found only by plowing through many catalog pages and tables have been ingeniously condensed on the two sides of the durable letter-size card illustrated above.

One side covers the broad WeldELL line of Taylor Forge welding fittings. For every nominal pipe size, ½" through 30", it shows the wall thickness for every weight of every fitting in every available material. It also shows all required dimensions of all types of fittings.

The other side covers the world's most complete line of forged steel flanges. For every nominal pipe size, ½" through 24", it gives all essential dimensional and bolting data for all types of flanges in all weights. A particularly useful table (see reproduction) is that showing welding neck flange bores which enables you to determine the I.D. of any nominal pipe size without separate calculation. Thus the sheet gives you O.D. and I.D. of any weight of pipe.

The card is varnished to make it stand the steady usage you are certain to give it. To obtain your copy see your Taylor Forge distributor or **MAIL THE COUPON.**

TF

TAYLOR FORGE

TAYLOR FORGE & PIPE WORKS
General Offices and Works: P. O. Box 485, Chicago 90, Ill.
Offices in all principal cities.
Plants at: Carnegie, Pa.; Fontana, Calif.; Hamilton, Ont., Canada

Please send me one of your fitting and flange sheets.

NAME_____

POSITION_____

COMPANY_____

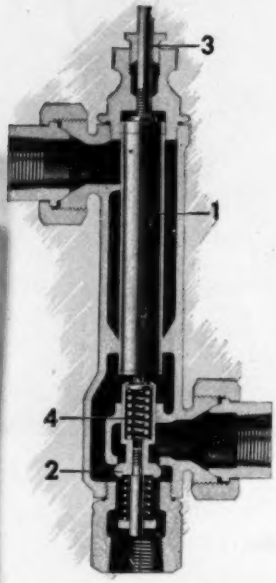
STREET ADDRESS_____

CITY_____ ZONE____ STATE_____

510-1051 Mail to Taylor Forge & Pipe Works, P. O. Box 485, Chicago 90, Ill.

For Her Sake

Temper it with
SARCO DB WATER BLENDERS



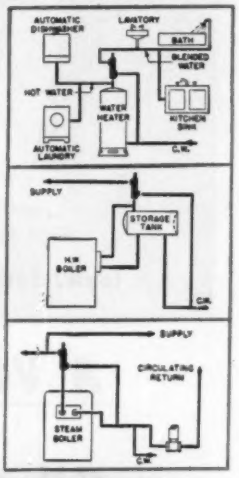
Modern heating requires boiler water at 160 to 180°F and higher. Where submerged coils or "below-water-line" heaters are used, this can also be the temperature of domestic hot water.

While such high temperatures may be desirable for automatic dish washers or washing machines, they are too high for bath room fixtures.

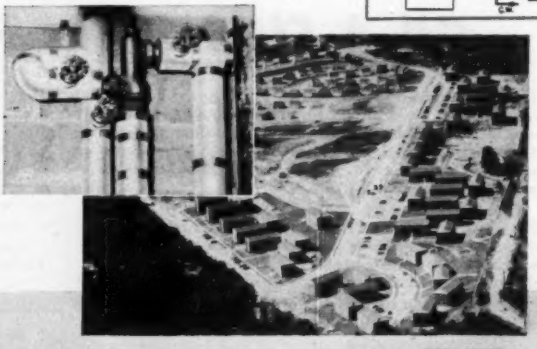
By installing a Sarco Blender, both temperatures are automatically controlled at the desired level.

It provides two different constant temperatures also from independent water heaters.

Full information in Bulletin 803.



SARCO DB BLENDER, a quality tempering valve. A powerful liquid expansion thermostat 1 with standard Sarco bellows modulates flow of *both* hot and cold water by positioning single seated valve 2, of bronze. Positive shut-off when no water is drawn. Standard range 120°F to 160°F adjustable at 3 with key provided. A relief spring 4 protects thermostat. Note union connections for easy inspection and cleaning. Sizes ½" to 3".



342

Forty-five 1¼" Sarco DB blenders on hot water converters at Gregory Estates, Seat Pleasant, Md., a 500 garden apartment community.

SARCO COMPANY, INC.

EMPIRE STATE BUILDING, NEW YORK 1, N. Y.

SARCO CANADA LTD., TORONTO 5, ONTARIO

REPRESENTED IN PRINCIPAL CITIES

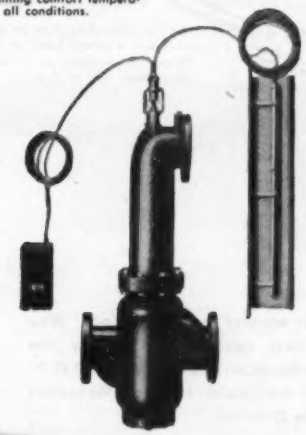
York County Home Annex, York, Pa. Architect: Clair S. Buchart, York, Pa. Engineer: William K. Hood, York, Pa. Heating Contractor: C. C. Kottcamp & Son, York, Pa. Floor type Radiant Heating System divided into 13 zones, each controlled by type STA-1 Sarcotherm controls and "Thermoray" comfort thermostats.

ENGINEER-MANUFACTURER CO-OPERATION results in perfect comfort

WITH

Sarcotherm
RADIANT HEAT CONTROL

The heart of the Sarcotherm control system for radiant or forced hot water heating is this unique control valve. It is actuated by liquid expansion thermostats, one located outside the building and one in the valve itself. Between them they anticipate changes in heat loss ratio, thus maintaining comfort temperatures under all conditions.



● The Sarcotherm Comfort Control "Thermoray" is an extremely sensitive thermostat affected by both radiation and convection.

As part of the Sarcotherm control system it affords compensating indoor control without stopping circulation.

● Here is a striking example of the advantages of close cooperation between the architect's designing engineer and an equipment manufacturer who not only offers complete weather compensated control systems for hot water and radiant heating, but can supplement this with 30 years' experience and the most complete line of accessories for all types of heating.

In the case of York County Home Annex illustrated, engineer William K. Hood, York, Pa., designed a radiant heating system divided into 13 zones, each individually controlled by Sarcotherm.

An important feature of the control system is the unique "Thermoray," a very sensitive heat loss thermostat, influenced by both radiation and convection.

Sarcotherm also regulates supplementary baseboard heating, and unit heaters.

Sarcotherm engineers are eager to work closely with architects, consulting engineers and contractors to develop the best control hook-up and assure its correct installation.

Send us your next problem—there is no obligation. Or write for complete catalogue.

23

Sarcotherm CONTROLS, INC.
EMPIRE STATE BUILDING · NEW YORK 1, N. Y.

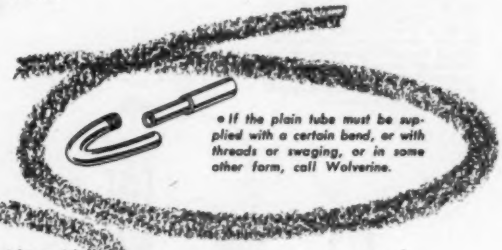
A SARCO PRODUCT

So now you must make something different, eh!

As a subcontractor you have been asked to furnish a product for the emergency. Fine. You have all the facilities to produce it, with one exception—the manufacture of one component—a tubular part—which is "a little out of your line."

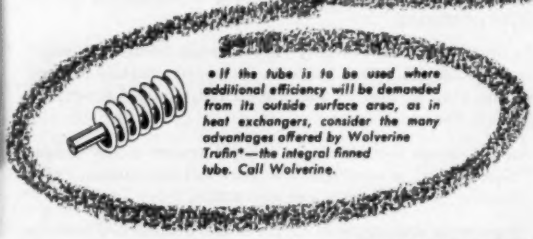
So you must seek outside help. You naturally come to Wolverine Tube Division, who has had over thirty years experience in the manufacture and fabrication of tubing and has worked closely with government specifications.

With this experience, supported by man-power and special equipment, Wolverine is ready to accept your problem with a thorough understanding of the needs of the job. You can be sure that the tubular part which Wolverine furnishes will meet all requirements.



• *If the plain tube must be supplied with a certain bend, or with threads or swaging, or in some other form, call Wolverine.*

• *If the end of the tube must be closed or partially closed, or if it needs beading, flaring or other end treatment, call Wolverine.*



• *If the tube is to be used where additional efficiency will be demanded from its outside surface area, as in heat exchangers, consider the many advantages offered by Wolverine Trufin*—the integral finned tube. Call Wolverine.*

Your answer to the question: "Who is best equipped to supply the tubular part I need for this D.O.?" can be found here at Wolverine Tube Division.

*Reg. U.S. Pat. Off.

WOLVERINE TUBE DIVISION
Calumet & Hecla Consolidated Copper Company
INCORPORATED
Manufacturers of seamless, non-ferrous tubing
1419 CENTRAL AVE. • DETROIT 9, MICH.

Sales Offices in Principal Cities ***Plants in Detroit, Mich. and Decatur, Ala.***

Wolverine Mill Depots:
DETROIT, MICH. • DECATUR, ALA. • HOUSTON, TEXAS • LOS ANGELES, CALIF.
LONG ISLAND CITY, N. Y. • PHILADELPHIA, PA. • PROVIDENCE, R. I. • ST. LOUIS, MO.

Export Department, 13 E. 40th St., New York 16, N. Y.

Gimbels

great Pittsburgh store now completely air conditioned. Installation includes

1685 kno·draft

Type HPC High Pressure Air Diffusers

New Outlets Eliminate Drafts

Gimbels new weather control system includes nearly three miles of "breathing tubes" -- the metal ductwork for carrying air.

Most of this ductwork is for distributing the conditioned air throughout the area the new system serves. But some of it is for "return" air from each floor, going back to the filters and spray cooler.

The Carrier Corp. installed all this ductwork. An outstanding feature is that most distribution ducts are small in size—only 14 inches wide and eight inches high—installed unobtrusively on the ceiling.

GREATER VOLUME

The explanation is that this is a high pressure system, and that the smaller ducts carry a much greater volume of air.

From the supply fan, the air is forced down a central shaft, formerly a freight elevator shaft. From this central shaft, twin feeder ducts branch off down both sides of each floor. And these twin feeder ducts are connected at regular intervals by the distribution ducts, forming a huge grid pattern.

The air diffusers, or outlets, are installed at regular intervals along all the distribution ducts. Gimbels new system includes 1,685 of these specially-designed outlets, which are made by the W. B. Connor Engineering Corp., New York.

These outlets can be individually adjusted. They release the cool air in a virtual jet, in a horizontal fan pattern well above the heads of clerks and customers.

But there is no draft, although the air jet does create a gentle stirring which maintains a "live" fresh atmosphere throughout the whole area.

● Kno-Draft Type HPC High Pressure Air Diffusers operate at high pressure and velocity yet provide *draftless* distribution of air to large open areas. Reason—a new type perforated damper, combined with an interior baffle and jet exit.

Kno-Draft Type HPC High Pressure Air Diffusers are space savers, too—requiring only small, uniform, exposed ducts. They are completely adjustable to any volume between 90 and 180 cfm, or may be shut off. Operating velocities up to 3,000 fpm with 2" static pressure in ducts. Air induction high, with primary air 25° colder than room air.

For complete information on Kno-Draft Type HPC High Pressure Air Diffusers and their application possibilities for you, mail the coupon today.

TRADE MARK "KNO-DRAFT" REG. U. S. PAT. OFF.

W. B. CONNOR ENGINEERING CORP.

Danbury, Connecticut

Air Difrusion • Air Purification • Air Recovery

In Canada: Douglas Engineering Co., Ltd., 190 Murray Street, Montreal 3, P. Q.

W. B. CONNOR ENGINEERING CORP.
Dept. G-101, Danbury, Connecticut

Please send me, without obligation, Bulletin K-26, which provides full information on the NEW TYPE HPC Kno-Draft Air Diffuser.

Name .....

Position .....

Company .....

Street .....

City ..... Zone ..... State .....

Prominent Contemporary Hospitals

Using POWERS Pneumatic TEMPERATURE and HUMIDITY Control

Proper temperature—external and internal, hastens recovery of patients.

Lee County Hospital and Health Center, Opelika, Alabama
Architect and Engineer: Charles H. McCauley, Birmingham, Alabama
Contractor: Capital Refrigeration Co., Inc., Montgomery, Alabama

John Sealy Hospital, University of Texas, Medical Branch, Galveston, Texas
Architects: C. H. Page & Son, Austin, Texas
Consulting Architects: Eggers & Higgins, New York, N. Y.
Mechanical Engineers: Zumwalt & Vinther, Dallas, Texas
Contractor: Farwell & Company, Dallas, Texas

Powers control provides optimum temperature and humidity for patients, doctors and nurses, in operating and recovery rooms, delivery and X-ray rooms and nurseries, private rooms and wards.

Sparks Memorial Hospital, Fort Smith, Ark.
Architect: E. Chester Nelson, Ft. Smith, Ark.
Engineers: Carnahan & Thompson, Oklahoma City, Okla.
Contractor: G. W. Shirley & Son, Van Buren, Ark.

For Greatest Comfort and Lowest Maintenance Cost Use POWERS Control

Bergen Pines County Hospital, Paramus, New Jersey
Architects: York & Sawyer, New York City
Engineer: Jaros, Baum & Bolles, New York City
Contractor: Frank A. McBride Co., Patterson, N. J.

POWERS

St. John's Hospital, Santa Monica, Cal.
Architect: John W. Maloney, Seattle, Wash.
Engineers: Lincoln Boullion & Associates, Seattle, Wash.
Contractor: Johnston & Washer, Los Angeles, Cal.

POWERS

Veterans Administration Hospital, Wilkes Barre, Pa.
Architects-Engineers: Kelly & Gruzen and Isadore Rosenfield
Mechanical Engineer: Edward E. Libby
Contractor: Frank A. McBride Co., Patterson, N. J.

THE POWERS REGULATOR COMPANY

Established 1891—Offices in Over 50 Cities—See Your Telephone Directory

GENERAL OFFICES AND FACTORY—SKOKIE, ILL.

3400 Oakton Street — Phone Skokie 6700

CHICAGO 12, ILLINOIS ★ 2619 N. Ashland Avenue
NEW YORK 17, NEW YORK ★ 251 East 40th Street
LOS ANGELES 5, CALIF. ★ 1808 West 8th Street
TORONTO, ONTARIO ★ 195 Spadina Avenue
MEXICO D. F. ★ Apartado 61 Bis

We have been asked:

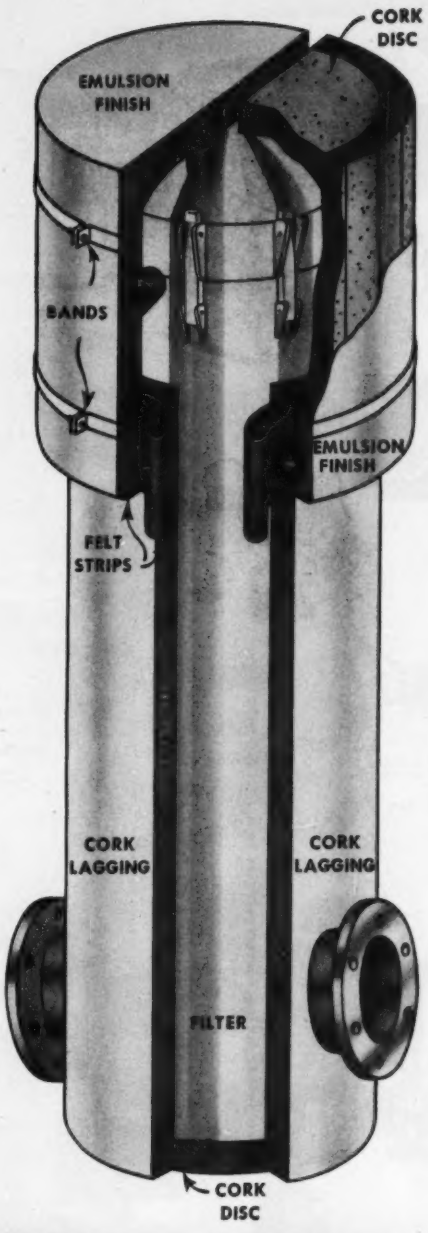
"What's the best way to insulate air-conditioning filter tanks—and provide easy access for cleaning?"

We were recently asked this question by an engineer who was designing an air-conditioning system for a large office building. The filters were 15″ in diameter with a capacity of 65 gallons of water per minute. They handled 10% of the water circulated through the zone pumps at temperatures between 40° and 50° F. Here's the answer we gave him:

Insulate the filters with cork lagging and provide removable heads of the same insulation material to allow for easy access for cleaning. Cork lagging was the material recommended because of its high insulating efficiency and natural moisture resistance. It is also a strong insulation that can be fabricated on the job to any desired shape and will withstand the abuse of frequent handling when used for removable covers.

Two inches of cork lagging should be applied to the body of the filter, banded on 6″ centers, and then coated with Armstrong's Asphalt Emulsion. Fabricate the removable covers in two sections from cork lagging and a cork disc, cover with sheet metal or coat with emulsion, and then anchor in place with removable bands. Felt strips should be used between the removable sections as well as between the top and body insulation to provide a tight seal. The top can be easily removed by loosening the bands.

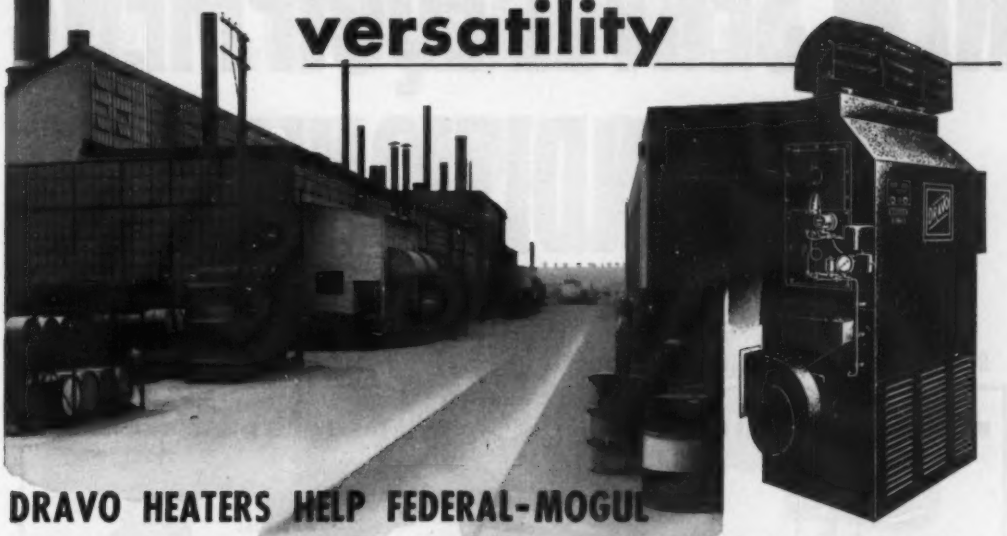
Helping you choose the best method for insulating any piece of equipment is only a part of the job of Armstrong's Contracting Service. In addition to technical advice, our service offers a complete line of fine quality insulating materials and skilled mechanics to apply them. For full information on this contracting service, call the Armstrong office nearest you or write directly to Armstrong Cork Company, 4410 Concord Street, Lancaster, Pennsylvania.



ARMSTRONG'S INDUSTRIAL INSULATIONS

ANOTHER EXAMPLE OF

versatility



DRAVO HEATERS HELP FEDERAL-MOGUL CORPORATION SOLVE A FOUNDRY VENTILATING PROBLEM

10 DRAVO *Counterflo* HEATERS . . .

- **Keep atmosphere healthy**
- **Equalize pressure**
- **Provide constant temperature**
- **Increase employee morale**
- **Improve efficiency**
- **Step up production**

At Federal-Mogul Corporation's non-ferrous foundry in Detroit, exhaust equipment removes 400,000 cu. ft. of contaminated air per minute to eliminate smoke, fumes, dust and excessive heat. During warm weather, make-up air comes from open windows and doors. But providing warm make-up air in winter was a difficult problem, for natural infiltration did not supply sufficient make-up air and what did enter chilled the working area.

Federal-Mogul solved this by installing 10 Dravo *Counterflo* Heaters at strategic locations in the foundry. Mounted horizontally or vertically, each heater, equipped with automatic modulating controls, produces 22,000 cu. ft. of even temperature air per minute. Heaters are shut down at night, but heat the building quickly next morning. In summer, the units are used for fresh air ventilating.

RESULTS: Normal atmospheric pressure maintained, facilitating exhausting of heavy gases; improved comfort; healthier working conditions; increased worker efficiency; improved morale, better production records!

VERSATILE DRAVO HEATERS ARE AT WORK IN MANY TYPES OF INDUSTRIAL AND COMMERCIAL APPLICATIONS

Dravo *Counterflo* Heaters are ideal for space heating and ventilating in warehouses . . . machine shops . . . railroad repair shops . . . process industries . . . stores . . . schools . . . churches . . . military installations.

DRAVO HEATERS OFFER YOU . . .

- **Low initial cost . . . users report 30% to 60% savings.**
- **Concentration of heat at working level.**
- **Low Fuel consumption . . . burn gas or oil . . . easily converted.**
- **Automatic Control . . . on-off or modulating controls.**
- **Long service life, low maintenance . . . stainless steel combustion chamber.**
- **Mobility . . . easily moved to any location.**
- **Flexibility . . . where floor space is limited, can be wall-hung or suspended from trusses.**

We will be glad to send you more information about heating and ventilating with Dravo *Counterflo* Heaters. Write today for Bulletin No. PQ-52

DRAVO CORPORATION

HEATING DEPARTMENT
Dravo Bldg., Fifth & Liberty Ave.
PITTSBURGH 22, PA.

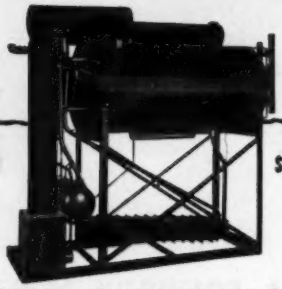
ATLANTA • BOSTON • CHICAGO • CLEVELAND • DETROIT • NEW YORK • PHILADELPHIA • PITTSBURGH
Sales Representatives in Principal Cities

Manufactured and sold in Canada by Marine Industries, Ltd., Sorel, Quebec

Export Associates: Lynch, Wilde & Co., Washington 9, D. C.

NEW SERVEL EQUIPMENT AIR-CONDITIONING OR

SERVEL ABSORPTION EQUIPMENT



WATER CHILLER: Rated capacity under standard ASRE conditions—25 tons. Hermetically sealed absorption refrigeration system. Refrigerant, water. Absorbent, lithium bromide. Source of energy, steam. Refrigeration unit operates under a vacuum.

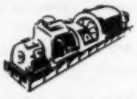
OPERATES ON ANY OF THESE SOURCES OF STEAM

GAS-OPERATED STEAM GENERATOR

INDUSTRIAL BOILER

WASTE-HEAT BOILER

CONDENSATE STEAM GENERATOR



TURBINE EXHAUST STEAM

DISTRICT STEAM LINES

Self-Contained Unit: 5 tons of cooling, heating optional.

All-Year Air Conditioners. In 3-ton and 5-ton sizes. Cooling and heating. For single or multiple installation.

SUPPLIES CHILLED WATER OR AIR CONDITIONING FOR

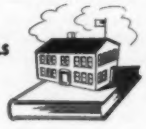
INDUSTRIAL PROCESSING

FACTORIES

HOSPITALS

HOTELS

SCHOOLS



OFFICES

STORES

HOMES

SIMPLIFIES ALMOST ANY COOLING APPLICATION

• Light enough to install anywhere • Runs on steam
from any source, any pressure • Electric-power needs are nominal
• Modulates down to 50% of capacity

NO MATTER how large or how small your cooling or air-conditioning job, the chances are that one of Servel's absorption units can do it better, easier, and at less cost.

If it's chilled water for industrial processing, or air conditioning large buildings that you're interested in, take a look at the new Servel 25-Ton Water Chiller. This latest addition to the Servel line runs on steam from any source, at any pressure. If waste steam or waste heat is available, you can operate on it and save most of the normal costs of fuel.

Electric-power needs are nominal, so you can usually connect to existing wiring. The unit is light, quiet, vibration-free—so much so that you can install it on any floor, without expensive bracing. It supplies chilled water in industrial processes, and—by the use of heat exchangers—will supply air conditioning in any building by simple piping.

For smaller areas, the Servel Self-Contained 5-Ton Air Conditioner, and the 3-ton and 5-ton units provide flexible, low-cost air conditioning. All Servel units have the famous Servel no-moving-parts cooling system. Thus you get long life, low maintenance, quiet, dependable operation.

Get complete information today. And if you'll enclose details of your process cooling or air-conditioning problems, we'll be glad to tell you which unit, or combination of units, our application engineers recommend. Servel, Inc., Evansville 20, Ind.

WHY SERVEL IS YOUR BEST AIR-CONDITIONING BUY

- No Moving Parts in Cooling System To Wear Out
- Low Maintenance Costs
- Hermetically Sealed Circuits
- Long Life
- Completely Safe Operation
- Chilled Water Circuit Operates Under Normal Pump Pressure
- 5-Year Factory Warranty

SEND COUPON FOR MORE INFORMATION

Servel

AIR CONDITIONERS

FOR INDUSTRY • FOR HOME • FOR BUSINESS

Servel, Inc.
Department R-210, Evansville 20, Indiana

Gentlemen:

Please send me more information on the following:

Servel 25-Ton Water Chiller_____
Servel Self-Contained Air Conditioner_____
Servel 3- and 5-Ton *All-Year* Air Conditioners_____

*Name*_____

*Firm*_____

*Address*_____

IF YOUR JOB CAN BE DONE BETTER WITH AIR CONDITIONING OR COOLING, IT CAN BE DONE BEST WITH SERVEL

Precipitron®

BEFORE—A close-up shows aluminum collector plates in clean PRECIPITRON cells. This is the way they appear after periodic washings, which dispose of all the trapped air-borne particles.

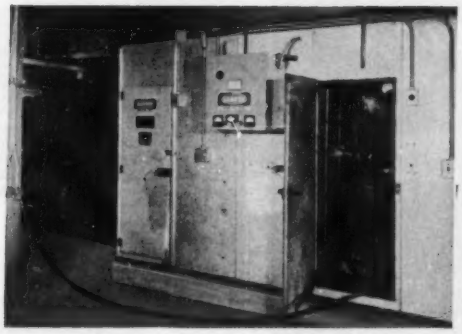
AFTER only 2½ weeks cleaning "normal atmospheric" air, the same plates had accumulated this much dirt. PRECIPITRON stops air-borne dirt, soot, pollen, oil mists.

ELECTRONIC *Air* CLEANING

J-80227A

—ELECTRONIC BARRIER

Against invisible dirt



Cleaning efficiency is 90% or better at 333 fpm; 85% or better at 400 fpm. Maximum linear space required in duct is less than 8 feet.

PRECIPITRON cell banks are readily accessible for thorough washing. You don't remove any part of the equipment. You don't handle dirty or messy elements. You just wash them down in place with a garden-type hose. The dirt flushes directly into the drain.

Where desired, PRECIPITRON can be furnished with Semi-Automatic Washer, or as a completely encased unit for minimum installation expense.

Air that's "fit to breathe" *isn't* clean enough. A particle of invisible, air-borne dust, no larger than 1/100,000 of an inch, can create an image on a bombsight behind which a battleship might hide. Minute corrosive particles will mar the super-finished surface of a vital engine part. Contamination by bacteria-carrying specks is dangerous in hospitals, laboratories or food processing plants. In industrial and commercial buildings, in industrial processes, in communication centers, stores, offices, and even in the home—air-borne dirt is costly everywhere.

But PRECIPITRON—the electronic air cleaner—will take *all* the dirt from the air, down to particles so tiny they can be seen only with an Ultra Microscope. If you wish to add electronic air cleaning to your present systems—or if you wish to *put air to work* with Sturtevant air handling or air conditioning apparatus incorporating electronic air cleaning—contact your local Westinghouse-Sturtevant office, or write to Westinghouse Electric Corp., Sturtevant Division, Hyde Park, Boston 36, Mass.

YOU CAN BE SURE...IF IT'S Westinghouse

Specify Janitrol GAS-FIRED UNIT HEATERS for these advantages

- ★ Eliminates need of expensive central-heating system and labor costs of operating and maintenance men.
- ★ Minimum of installation space required and no fuel to order and store.
- ★ Flexible operation, heat is used only when and where it is needed.
- ★ Low operating costs resulting from the efficient use of clean gas heat, automatically controlled.
- ★ Engineering layout service assures sound installation planning to meet individual heating requirements.
- ★ Heating can be combined with ventilating or summer air-conditioning distribution systems.

30 SIZES AND TYPES OF UNIT HEATERS

SUSPENDED MODELS

Equipped with Propeller Fans or Blower Units.

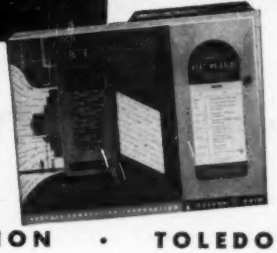
18 sizes and types provide capacities ranging from 50,000 to 450,000 Btu/hr. Features include individual ribbon burners converting heat to separate heat exchangers to provide greater efficiency in less space. Blower equipped units are used to quietly circulate warm air against higher static resistance, permitting the use of ducts.

DUCT HEATERS

No fan or motor is required for these units as installations are made to temper ventilating air or to supply heat through summer air-conditioning duct work where air is circulated by a blower system. 5 sizes provide capacities from 85,000 to 225,000 Btu/hr.

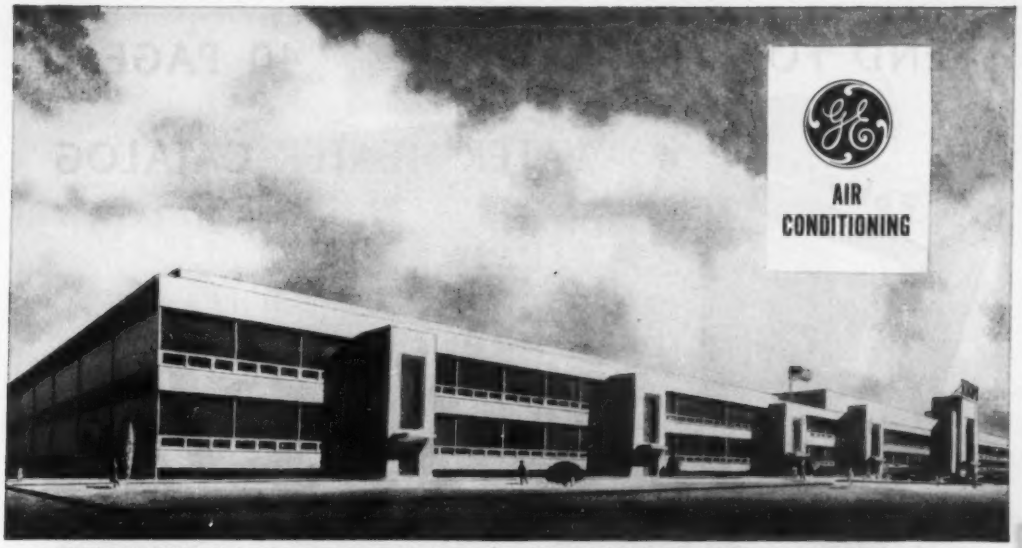
HEAVY DUTY FLOOR MODELS

Sectional construction of units permits heating capacities up to 1,500,000 Btu/hr. Sections can be equipped with directional diffuser outlets or to connected duct work. Units widely used for heating large areas such as airplane hangars, warehouses and plants handling large assemblies.



Write today! *for helpful guide on the practical use of unit heaters for commercial and industrial installations. Ask for A.I.A. File 30-C-43.*

SURFACE COMBUSTION CORPORATION • TOLEDO, OHIO



COMPLETE NEW WING of International Business Machine Corporation's Poughkeepsie, N. Y. plant (above, left) will be heated (cooling by same units to be added later) by 123 G-E Central Plant Air Conditioners. Architects and consulting engineers: Lacey, Atherton, & Davis; Seelye, Stevenson, Value & Knecht. General contractor: Sordoni Construction Co., Inc. Air conditioning contractor: Mance Corporation.

G-E AIR CONDITIONING HELPS IBM SAVE SPACE

Compact G-E System planned to provide heating now— add cooling later without altering ductwork

Motor mount always right side up
Space-saving filter section
Face, by-pass dampers control humidity
Expandable coil section, changed easily

Sound Investment. G-E Air Conditioners (vertical model shown) are so compact, quiet, handsome, they're often installed in open. Thanks to "Building Block" design, you select from 40 different arrangements. Helps you save engineering, installation time and space.

Space is precious in modern industrial plants. That's why flexible, economical G-E Air Conditioning was chosen for the new addition to IBM's Poughkeepsie, N. Y. factory.

On upper floors, compact G-E *vertical* air conditioners fit into return air passages. On the ground floor, G-E *horizontal* units—good-looking and quiet—are hung from the ceiling right in the area each one serves.

Easy to add cooling. At first, only heating, ventilation, and filtered air will be provided. It's planned that the same units will later provide cooling. To do this, proper coil space has been provided so that ducts won't have to be altered. Disturbances to production will be at a minimum.

Write now for free data on G-E Air Conditioning Systems that improve efficiency in industry, boost profits in hotels, apartments, office buildings...or see your architect, engineer, contractor. Ask, too, about convenient, economical G-E Drinking Water Coolers for offices and factories. General Electric Company, Air Conditioning Division, Sec. HP-21, Bloomfield, N. J.

You can put your confidence in—

GENERAL ELECTRIC

SEND FOR THE NEW P-K 40 PAGE WATER HEATER CATALOG

p-k catalog No. 202 provides you
with a simple, rapid means of selecting the
correct hot water heater for forced circulation.
Capacities from 95 to 101,000 gph.
Steam pressures range from 0 to 100 psig.
Standard "U" Tube Heaters are available
in 2- 4- or 6-pass construction.
Water temperatures range from 40° to 100°F. inlet
and 80° to 300°F. outlet.

1035

other TAB INDEX FEATURES

- **Condensate Cooler tables**
- **Dishwater Booster Heater tables**
- **Gravity circulation tables**
- **Hot Water Service Heater tables**
- **Pressure drop tables**
- **Typical piping arrangement**

the P-K **please send p-k catalog 202**

Patterson-Kelley Co., INC.

89 BURSON ST., EAST STROUDSBURG, PENNA.

Name _____ Position _____

Company _____

Street _____ City _____ State _____

...and Save money doing it!

Make DOREX AIR RECOVERY part of your air conditioning or heating plans

An air conditioning system works like this: fresh air is brought in from the outside, heated or cooled according to season, and circulated throughout the conditioned area. This heating and/or cooling is what costs money. So, if you can reduce the amount of outside air you have to take in — down go your expenses.

Dorex Air Recovery reduces, *by as much as two-thirds*, the amount of fresh outside air required. You "make your own" fresh air by passing *used* air through the remarkable Dorex C Cell — wherein beds of activated carbon remove all odorous and gaseous impurities, renewing air freshness.

Thus, with Dorex Air Recovery you have far less new air to heat or cool. Less heating or cooling capacity is needed — saving both critical materials and money. Experience, based on more than 7,000 Dorex installations over the past 20 years, indicates that every $100 invested in Dorex Air Recovery should return a $400 saving in initial equipment, and every $1 spent for Dorex maintenance should return a $4 saving in operating costs.

It will certainly pay you to investigate Dorex Air Recovery.

TRADE MARK "DOREX" REG. U. S. PAT. OFF.

DOREX
Air Recovery

W. B. CONNOR ENGINEERING CORP.
Danbury, Connecticut
Air Diffusion • Air Purification • Air Recovery
In Canada: Douglas Engineering Co., Ltd.,
190 Murray Street, Montreal 3, P. Q.

W. B. CONNOR ENGINEERING CORP.
Dept. A-101, Danbury, Connecticut

Please send me, without obligation, full information on Dorex Air Recovery.

Name_____

Position_____

Company_____

Street_____

City_____ Zone____ State_____

17 years of Trouble-free

±½° F. TEMPERATURE CONTROL AT NBC

Taylor-Controlled Air Conditioning System at NBC, RCA Building, New York

RCA Building, New York, October 1, 1951. Without interruption for over 17 years, the Taylor-controlled central air conditioning system here has maintained ±½°F. in the National Broadcasting Company's offices and studios.

Completed in 1934, it was the first major air conditioning installation using Taylor Fulscope* Wet and Dry Bulb Controllers. "Almost human!" is the way it was described by the air conditioning engineer who specified the control system and supervised the installation.

17 years ago Taylor engineers were so confident of trouble-free service that temperature tube systems, some as long as 600 feet, were cemented into partitions in the RCA Building. That confidence came from tube system research, pioneered by Taylor 20 years prior to 1934. That same research has been routine throughout the years to bring you many new refinements in tube system design, plus new control instruments. Today Taylor gives you even greater assurance of trouble-free air conditioning.

*Registered Trade-Mark

Whether you're planning air conditioning for human comfort or product quality—or both, specify Taylor Instruments for the very finest in simplicity and dependability. Ask your Taylor Field Engineer!
Or write Taylor Instrument Companies, Rochester, N. Y., or Toronto, Canada.
Instruments for indicating, recording and controlling temperature, pressure, flow, liquid level, speed, density, load and humidity.

Taylor's Centennial
ACCURACY FIRST
SINCE 1851

Taylor Instruments
MEAN
ACCURACY FIRST
IN HOME AND INDUSTRY

specify
ACME CONDENSERS

and you meet every sales requirement

Through practical experience and constant research Acme Engineers have developed a wide variety of models and sizes of Freon, Ammonia, Shell and Coil and Shell and Tube Condensers. The Acme Condenser Line is varied enough to permit the selection of the right model and the right size unit to meet *every* requirement.

FREON CONDENSERS

- Exclusive method of tube support eliminates noise.
- Easy to clean.
- Leak proof joints.
- Combination Heads.
- More than 120 different sizes.
- A.S.M.E. Certification.

MODEL SRF

Shell & Coil and Shell & Tube CONDENSERS

Shell & Coil
Drainable Coils
Compact
Inexpensive

Shell & Tube
Cleanable tubes
Inexpensive
Compact
Dual Pass (J300 & larger)

SHELL & COIL

SHELL & TUBE

AMMONIA CONDENSERS

Exclusive Locknut Construction Available
Rolled-in or Welded Tubes
A.S.M.E. Construction and Certification
Locknut Assembly for Easy Replacement
Custom Built

AMMONIA

These are only a few of the features and advantages that have made ACME Condensers the choice of the heavy refrigeration Industry for quality, design and lasting performance. Write for catalog on equipment you require.

ACME ALSO MANUFACTURES:

Dry-Ex* Water Coolers • Hi-Peak* Water Coolers • Flow-Cold* Liquid Chillers • Fin Coils • Cooling Towers • Oil Separators • Liquid Receivers • Heat Exchangers • Bio-Cold* Industrial Unit Coolers • Flow-Cold Refrigeration Units • Convectors

* Trade Mark

ACME INDUSTRIES, INC.
Dept. HP
Jackson, Michigan

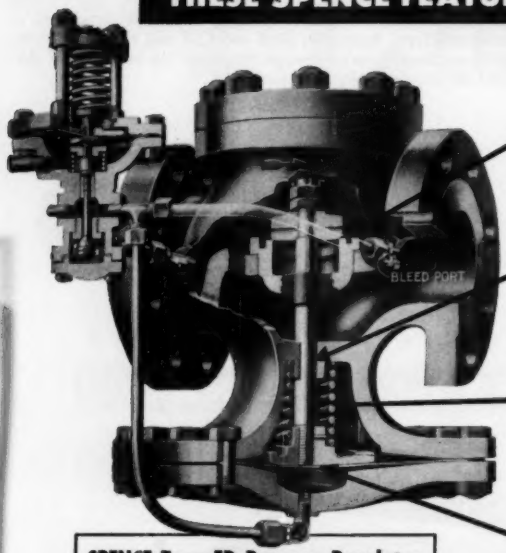
ACME PRODUCTS

continuously serving the refrigeration industry since 1919

HERE'S PROOF

You Can Cut Costs of Pressure and Temperature Control

THESE SPENCE FEATURES SHOW YOU HOW



SPENCE Type ED Pressure Regulator

SECO METAL SEATS AND DISCS — Durable SECO Metal resists wiredrawing. *More than twenty years of experience* in thousands of installations has failed to produce a single case where SECO Metal has been cut by steam.

PACKLESS CONSTRUCTION — All Spence main valves and most pilots are built without stuffing boxes. This minimizes friction . . . eliminates much time-consuming maintenance.

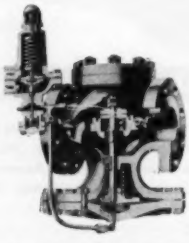
SPRING OUT OF PATH OF STEAM — The spring in the Spence Regulator is out of the path of the steam or other fluid flowing through the valve. It operates at low unit stress for exceptionally long life.

LARGE BALANCED DIAPHRAGM—Spence metal diaphragms, under usual conditions, never require replacement. Spence Regulators have few moving parts and those few are ruggedly constructed and seldom require attention.

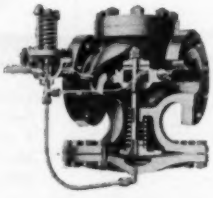
YOU BENEFIT by these and many other Spence features that assure *accurate, dependable* regulation year after year. That means *less down-time, less time and money wasted on replacement of parts.*

Spence Pressure and Temperature Regulators are built in sizes from *¼" to 12"* for service with *air, steam, water, oil or gas.* Only minor adjustments are needed to switch any Spence Regulator from one service to another.

Type BT150 Temperature Regulator—Tops in performance for both storage and instantaneous heaters.



Type EN Differential Regulator—Accurately controls differential between fluid delivered by regulator and some other source of pressure connected to the pilot spring chamber.



Type EQ Back Pressure Regulator — Completely packless, pilot operated for accurate control of the initial pressure.

These Companies Have Profited with SPENCE!

The Springs Cotton Mills
Ford Motor Company
Pennsylvania Power & Light Company
Jones & Laughlin Steel Corporation
National Tube Company
The Atlantic Refining Company
Great Lakes Steel Corporation
Todd Shipyards Corporation
Land O'Lakes Creameries, Inc.
General Electric Company
R. J. Reynolds Tobacco Company
Ohio Edison Company

and thousands of others

SPENCE ENGINEERING COMPANY INC.
WALDEN, NEW YORK

Spence

THE EDITOR'S PAGES

• MANY OF THE engineering societies, contractor associations and other groups that do not hold local meetings during the summer "vacation" period are resuming their regular programs this month or have recently done so. We therefore take this opportunity to stress the value — both to the individual and the organization — of *active* participation by every member in the group's meetings and other doings. In fact, almost any meeting is a good one (even if the speaker — which sometimes happens — falls a bit flat) if the attendance in proportion to the total membership is high and the audience has a lot of questions and discussion . . . . . The same idea holds to some extent also with a magazine like the one you're now reading. We're sure you'll find it of value to yourself — and we know our other readers will find it of interest and value to them — if you'll participate actively as a member of HPAC's "audience." Two specific ways (among many) of doing this are to contribute views and comment to our regular "Open for Discussion" department, and to take part in our Question of the Month feature. We'll look forward to hearing from you.

COMPLETE A.C. IS TEXTILE INDUSTRY TREND

TWO-THIRDS OF ALL major new textile industry air conditioning installations sold by Carrier Corp. since the beginning of 1950 have involved refrigeration as well as humidifying equipment. A survey of this "booming trend" toward positive temperature control covered well over a hundred textile industry contracts totalling many millions of dollars.

Virtually all new air conditioning systems for knitting mills, and for twisting, throwing, sizing and coning operations include refrigeration for temperature control, as well as air washers and humidifiers and other conventional equipment.

In the spinning and weaving sections of the industry, installations calling for evaporative cooling without refrigeration have dropped from 64 percent in 1950 to 23 percent since the beginning of 1951, with more than 76 percent of the major new systems providing for refrigerated cooling. In some cases refrigeration was added to existing evaporative cooling systems.

The major portion of the thousands of tons of refrigeration capacity included in the year and a half list will be supplied by centrifugal refrigeration machines. One installation alone totals 2200 tons of capacity.

Carrier's analysis pointed to basic economic factors as reasons for the trend. The high equipment speeds and increased lighting necessary for intensified production add to the heat loads inside the plant. At the same time, the lower humidities required in many cases for synthetic fibers have reduced the amount of cooling obtainable with evaporative cooling systems.

Machines operating at high speeds and fine tolerances using fibers subject to changes in elasticity must be kept at fairly constant temperatures to avoid seconds or shutdowns for readjustment.

And with labor costs becoming an increasingly large part of the total production cost, more stress has been placed on efficient working conditions to increase alertness and capacity to work and to reduce absenteeism.

The analysis of the textile industry jobs for an 18 month period shows installations of special self-contained laboratory units for textile testing rooms, and of heating and exhaust systems for eliminating dyehouse fog and condensate problems. Also, a number of contracts were signed for revisions and extensions of existing systems, in addition to the major new air conditioning installations.

NPA DEFINES AN "INDUSTRIAL PLANT"

THE NATIONAL Production Authority, U. S. Department of Commerce, issued last month an interpretation of its new construction regulations to define the term "industrial plant" as used in the regulations.

The significance of the official NPA definition of "industrial plants, facilities or projects" is that it spells out just what is and is not considered by NPA as a building project coming under this category.

The definition is important since the new regulations allow builders of industrial projects to self-authorize their orders for amounts of controlled materials up to 25 tons of steel, 2000 lb of copper and copper-base alloys and 1000 lb of aluminum.

Builders of commercial projects may self-authorize orders of these materials only up to amounts of 2 tons of steel, 200 lb of copper and *no* aluminum.

The interpretation defining an "industrial plant" follows:

"An industrial plant, factory or facility is a building, structure or project designed or intended for use in the production, manufacture, assembly or processing of products or articles, including mining and extractive operations.

"The term includes the following types of buildings, structures or projects when an integral part of the production, manufacturing, assembly, processing or mining and extractive operations: generating plant, railroad siding, loading platform, storage warehouse or repair shop, if such buildings, structures or projects are designed and intended for, and maintained and operated in connection with, such production, manufacturing, assembly, processing, or mining and extractive operations."

The interpretation then goes on to explain what the term does not include.

IDEA: ELEVATED WALKS WITH RADIANT HEATING

AN IDEA FOR elevated walkways for downtown Chicago is presented in a "prize paper" by Albert L. Tholin in the September Midwest Engineer, which is published by the Western Society of Engineers. Among the advantages pedestrians would enjoy, were the scheme to be used, would be fresher air, more sunlight, freedom from splashing by passing vehicles, and — if radiant heating were built into the sidewalk areas — no snow or ice on the walks.

In an estimate of cost, the total per lineal foot of walkway is given as $320, and per square foot of walkway as $20. The respective figures for radiant heating included in these totals are $16 and $1.

PRODUCTION HEATERS DRY FLOODED MOTORS

IN THE WAKE OF the recent floods, an instance came to light in which electric heaters proved they could take care of themselves and also help get a water-logged plant going again in a hurry, the Edwin L. Wiegand Co.

reports. Here's how the job was done when waters receded at the Sealright Co., Inc., Kansas City, Kansas, container manufacturers.

Four radiant heaters normally used to dry ink on cardboard were re-wired in series and allowed to dry themselves at a low heat. They were then installed in a temporary insulated plywood oven. An electric fan was used to circulate air in the oven, making it possible to hold the temperature constant at 200 F. Then "production" began.

Operating continuously 24 hr a day, the oven dried 300 motors (75 percent of the plant's total) and various other equipment in little more than two weeks. After that, the radiant heaters were quickly returned to their former occupation.

MORE SCRAP MEANS MORE STEEL

THE 1950 STEEL PRODUCTION of 95.5 million tons was the highest in history. The 1951 goal is 107 million, and on to 117 million in 1952. It took 29.5 million tons of purchased scrap to meet the 1950 figure, and for 1951, 32.5 million tons will be needed.

"QUOTE"

"Deferring maintenance today means only that you are taking money which should go into maintenance and throwing it into profit, which is taxed at a very high rate. It is just and fair that plants should be taxed during an accelerated defense production. But it is unwise for any plant to jeopardize its future, inflate its profits, and thereby increase its taxes, by failing to maintain its equipment in good operating condition.

"Such a company is operating against its own interests and those of its stockholders. It is risking the future job security of its employees. Worst of all, in a defense economy, it is endangering its productive capacity and, hence, its ability to fulfill its prime obligation to our government."—JOHN H. REDMOND, Assistant Manager, Production Dept., Koppers Co., Inc., at the annual meeting of the International Acetylene Association.

Primary sources of the type of scrap needed are industrial plants, railroads, auto manufacturers, farms and auto graveyards.

The Advertising Council's steel scrap campaign, together with the advertising campaign now underway by the individual steel makers, is aimed to drive home the message, "More scrap today means more steel tomorrow". Robert D. Mossman, manager of advertising, Jones & Laughlin Steel Corp., is coordinator of the council's campaign.

FORMS GROUP ON HEATING, A.C. CONTROLS

FORMATION OF A subcommittee on heating and air conditioning controls by the Instrument Society of America was announced last month by S. G. Eskin, Robertshaw-Fulton Controls Co., the group's chairman. A project under consideration is a technical manual covering design of typical controls and providing information on control systems and their operation.

Membership of the subcommittee comprises S. L. Furber, Minneapolis-Honeywell Regulator Co.; C. M. Garner, White-Rodgers Electric Co.; A. L. Hesselschwerdt, Jr., Massachusetts Institute of Technology; Milton Hilmer, Sarco Mfg. Corp.; N. J. Janisse, Johnson Service Co.; Paul F. Neess, Perfex Corp.; and Douglas Sterner, General Controls Co.

CTI COMMITTEES STUDY COOLING TOWER PROBLEMS

FIVE TECHNICAL subcommittees of the Cooling Tower Institute are now active, according to a leaflet issued last month which describes the objectives of the CTI, its organization, charter members and officers.

The acceptance test procedure subcommittee has published a form which enables tower manufacturers to indicate design factors and wet bulb factors for a range of temperatures and formulas for computing the design performance and the test performance. The purchaser may use this form to determine whether guarantees are being met without waiting for a convenient time for the manufacturer's engineers. If the preliminary test performance is satisfactory, he need not go to the expense of a formal test; if not, he may call for a thorough analysis and a formal test under CTI procedure.

Saturated air leaving a tower is sometimes drawn downward, reenters the tower and displaces fresh air, thus reducing the effective cooling capacity of the equipment. Wind velocity and direction and adjacent buildings have some effect. The recirculation subcommittee intends, by a study of operating towers, to determine a series of factors to be used in forecasting performance of any tower under a variety of conditions.

The wood maintenance subcommittee has succeeded in isolating two specific forms of deteriorating attack on tower lumber, fungal growth and chemical action. To further qualify causes and remedies, 20 Gulf Coast area towers have been selected for study. Into each of these towers have been placed, in several locations, 40 samples of different woods treated with different preservatives. Water analyses and operating data are being recorded, and as definite information appears it will be made public.

The intent of the water conservation subcommittee is to cull, from the many reports, information of aid to the cooling tower industry and the users of towers.

The several regulatory bodies and committees who are at work on this problem have been requested to forward to the institute any new information as it becomes available.

The standards subcommittee is not attempting to standardize cooling towers. However, recognizing certain minimum standards in all apparatus below which the design represents poor engineering practice, this group has in process a suggested specification for wood framed, wood cased, induced draft cooling towers.

1,000,000TH TRAFFIC DEATH IN DECEMBER

ACCORDING TO present estimates, the 1,000,000th motor vehicle death is due in December, according to the National Safety Council. The first fatal motor vehicle accident occurred in New York in 1899, as far as the council can determine.

The council is campaigning to postpone the grim anniversary.

Any attempt to identify the actual millionth victim would place the spotlight of notoriety arbitrarily on the tragedy of one family when "the spotlight should be turned on the tragedy of a nation which permits motor madness to go on," says Ned H. Dearborn, the council's president.

Why does "rain" often form inside roof spaces of a crowded store or school? (pages 19, 32)

Why does moisture gather on a water-and-vapor-proofed concrete floor? (page 32)

Why is it wrong to vent cold roof spaces to a warm inside space? (page 33)

Does a concrete floor slab lose heat only at the edges? (page 40)

In what direction does heat flow by Conduction? Convection? Radiation? (pages 11, 15)

Do "dead air spaces" exist with respect to heat flow? (page 16)

Why do metals radiate and absorb less heat than wood, plaster, rockwool? (pages 13, 46)

Why replace low-conductive air with denser materials of greater conductivity, i.e. ordinary insulation. (pages 11, 13, 14, 29)

The answers to these and numerous other problems of heat and vapor flow are found in the pages of the New 1951 Edition of

SIMPLIFIED PHYSICS of Vapor and THERMAL INSULATION

By Alexander Schwartz

Written in simple language easy to understand, yet accurate and complete enough to gratify the scientist. Crammed with information the engineer, architect, public official, builder, contractor, insulator, heating installer, need. Hundreds of universities and technical schools use previous editions as a text.

56 pages of Facts, Figures, Charts, Illustrations, and Explanations of Heat and Vapor Flow; Vapor Permeability; Condensation; Dry Rot; Conduction and Density; Convection; Radiation and Emissivity; Reflection and Absorption. Suggests solutions and illustrated techniques for practical problems of insulation installation, condensation, protection against heat loss or intrusion, radiant heating; cold storage.

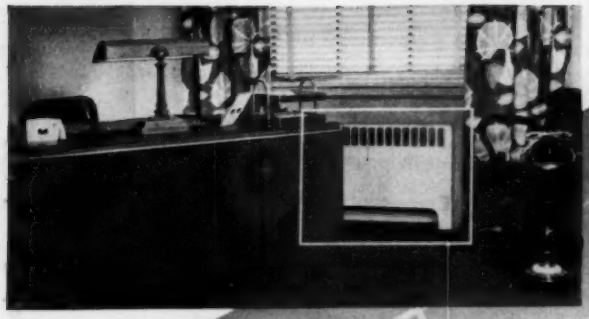
For The First Time
TABLE OF ABSORPTIVITY AND EMISSIVITY OF MATERIALS
Plus, Revised and Amplified, the Famous
CHART OF THERMAL INSULATION VALUES

These 2 charts are indispensable to anyone interested in building and heating. THE VALUABLE MANUAL IS FREE! Just fill in the coupon below.

Infra Insulation, Inc.,
10 Murray Street, New York, N. Y. Dept. (H-10)
Please send FREE copy of "Simplified Physics of Vapor and Thermal Insulation"—New 1951 Edition.
Name_____
Connection_____
_____
Address_____
☐ Send Infra Insulation prices.
☐ Send Infra sample.

In HERE are the answers

INFRA INSULATION, INC.
10 Murray St., N. Y., N. Y.
Phone: CO 7-3833

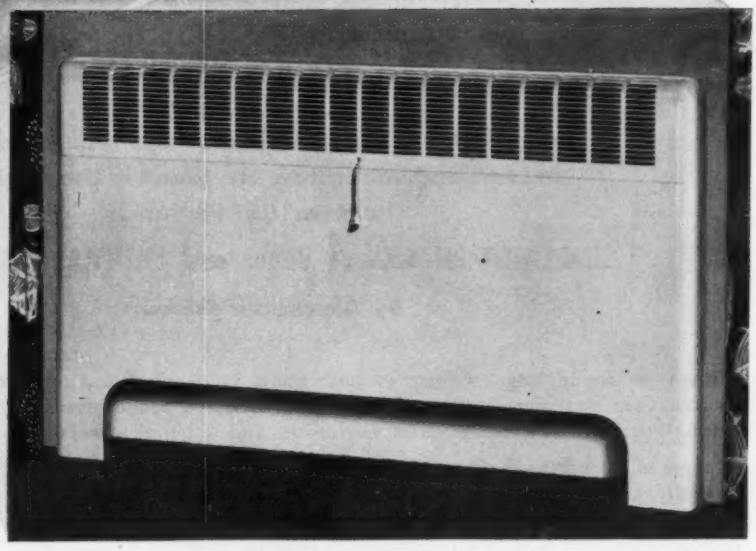


OFFICE CLOSE-UP

FREE-STANDING

ONE CABINET

SEMI-RECESSED



Use of Nesbitt model U reveals intelligent planning and good taste

When you step into one of today's modern, well designed offices,
step a little nearer for a close-up view of the NESBITT CONVECTOR.
For more and more planners are "closing the gap" between their smart new ideas
and the tell-tale dating of old fashioned radiators
by specifying NESBITT MODEL U CONVECTORS as the medium of heating.
NESBITT CONVECTORS are completely satisfying in both design and efficiency.
They are light in weight, fully assembled, and easy to install,
and they deliver the uniform comfort synonymous with *convection* heating.
To homes and apartments, add offices and commercial installations
when you think of NESBITT CONVECTORS. Send for Publication 262.

Manufactured by John J. Nesbitt, Inc., Philadelphia 36, Pa.

NESBITT Convectors | ARE SOLD EXCLUSIVELY THROUGH PLUMBING AND HEATING WHOLESALERS

• How about expressing your views on one of the articles in this month's issue of HPAC, for publication in these pages? Your comments on a controversial point, or additional information based on your experience, would — we're sure — be interesting and helpful to others. Or perhaps you'd like to say a little on some other matter of importance to plant engineers, building engineers, operating and maintenance men, heating, piping and air conditioning engineers or contractors? We follow here each month the practice at engineering society meetings of providing an "open for discussion" period. You are cordially invited to participate. Address the Editor, Heating, Piping & Air Conditioning, 6 N. Michigan Ave., Chicago 2.

Hot and Cold Ducts Feature Flexed Fiber System for School
Unit Piping Fabrications Save Space, Time, Money
Big Gain in Steam Use for New York Air Conditioning

"Open for Discussion"

LIKES PIPE STRESS ANALYSIS METHOD

A careful study of the method of pipe stress analysis developed by Theodore E. Bridge and published in several issues of HPAC was made by the writer and then adopted for stress analyses on several design problems during the past few months. A form was made up and reproduced to further aid in the speed of such computations, and it is now being learned by the pipe design group.

We have found that this method, when once learned, is a time-saving one and is very easily checked. Can the series of articles be purchased as a separate publication? If so, I believe all of our designers would like to own copies.—Robert B. McDonnell, Albany Designing, Inc.

WHAT DRAFT IS DEPENDS ON PERSON

The term "draft" is variously used with several meanings and even more interpretations. It has a special meaning to the banker, to the shipbuilder and operator, to the boiler and chimney maker, and to those whose business is concerned with air movement.

By far, the largest use of the term with the greatest breadth of interpretation is by the last-named group and people in general. We continually hear "I feel a draft" or "It is very drafty". When used in these statements, the meaning of "draft" is subject to great variation, since it is a condition measured by the individual. It seems axiomatic, therefore, that there might be as many interpretations of what a draft is as there are individuals, due to a lack of standard in understanding rather than in definition of what constitutes a draft. A definition may be influenced by such factors as being a buyer of equipment or a system, being a seller of a system or fans, or just a plain occupant of a space without means of adjusting the elements affecting comfort.

While the term is usually applied to air movement, this is a secondary factor since its measurement by body sensation is due to the "extent and duration of a local cooling of the body surface". This local cooling may be caused either by a rate of local air movement sufficient to cause a rapid loss of heat by convection, or by proximity to a cold surface causing body heat loss by radiation. Being seated or standing next to a cold wall or window may result in a feeling of draft from both convection and radiation, caused by air moved downward over the cold surface toward the floor and at the same time the radiating of body heat to the cold wall.

Under certain conditions, even a very slight air movement (in measured terms) may cause discomfort. Thirty-five fpm air velocity on a moist, bald head may be uncomfortable. A person with hair (an insulated head) in a dry condition might offer no objection to a velocity of from 75 to 100 fpm. Headwaiters in air conditioned dining rooms experience almost unexplainable difficulties with draft, since a normally-clothed man in a certain chair at a certain table will offer no objections, whereas a woman with light clothing, i.e., a strapless evening dress, will be most uncomfortable in the same chair at the same table.

Vendors of equipment have stated, when questioned about air movement, "Hardly any perceptible movement; never over 2 mph." Now, to the layman, 2 mph does not seem to be a perceptible air motion, yet it is 176 fpm, and can become an objectionable draft depending upon the temperature and humidity of the air of that velocity. The lower the air temperature, the greater the cooling at the point of impingement on the body at any given velocity.

The following definition for "draft" is offered not as one to be accepted, but as an invitation to others to better it: "A draft is a resulting sensation caused by local heat loss from the human body at a rate greater than the heat loss of the body as a whole."—Thomas H. Urdahl, Consulting Engineer.

TESTING FANS FOR NOISE LEVEL

At the risk of being repetitious, I would like to point out that the close-to-source method of making sound measurements would give more uniform results so long as highly localized sources of sounds are not missed in the test. One cannot assume that all machines will be of a design which precludes the possibility of highly localized sound sources; this is actually inherent in many types of machines (see Fig. 2 of my article in the June HPAC).

Since most noises are a complex mixture of many frequencies, it may prove impractical to express the rating in phons. To arrive at such a rating would require sound analyzing equipment, lengthy tests, and more involved calculations than at present.

In any case, we would still be sidestepping today's biggest problem

in expressing *annoyance* rating—the noise throb or pulse frequency. Symbolic ratings could be sharply defined, as I have previously indicated (see my comment on page 65 of the August issue). Publishing exact decibel ratings tends to crystallize public thinking into accepting them as accurate units of measure of the annoyance produced.—R. A. GERLITZ, Chief Engineer, Propellair Div., Robbins & Myers, Inc.

FIRING ROTARY OIL BURNERS WITH PRESSURE BURNERS

AS ONE OF THE oldest manufacturers of oil burning equipment in the country, we were surprised to note the photograph on the cover of the August HPAC and the accompanying article on page 73 of that issue which describes the application of a pressure burner to ignite a rotary burner, operating on No. 5 or No. 6 oil, as "novel." This method was first applied 10 years ago.

The pressure atomizing type burner as an igniter for horizontal rotary burners was developed for use in marine applications where a supply of gas for auxiliary ignition purposes was not available. These original installations were made with conventional pressure atomizing burners mounted as separate units, firing through the side of the combustion chamber or alongside the main burner.

In 1941 a standard mounting was developed, providing a fixed bracket, supported on the burner hinge plate, certain modifications were made in the conventional design of the pressure burner to be more consistent with the type of application, and the burner combination was approved for labeling by the Underwriters' Laboratories, Inc.

On automatic burners various types of control are applicable. Use of a stack switch or other thermal or radiant sensitive device with a simple programming relay is common practice. Light sensitive flame failure safeguards also are applicable and a single unit may be used for pilot sensing and main flame protection. A flame rod, of course, is unnecessary. Controls may be arranged to provide various combinations of operation. The most common application is that in which the main burner operates on a residual fuel, of No. 5 or 6 grade, and a small auxiliary tank is installed for No. 2 oil for ignition purposes. In this case it is usual to provide intermittent ignition, with the ignition burner being stopped entirely after the prescribed period of operation, or the oil supply and electric spark may be discontinued and the blower kept in operation to prevent over-heating of the exposed burner parts.

If the main burner and the ignition burner are both operating on a distillate fuel, it is sometimes found desirable to keep the latter in operation along with the main burner. Occasionally an application is encountered where the ignition burner alone is used to furnish heat for a certain light load or portion of a heating cycle.

In addition to marine work where fully automatic burners may be required, the more common applications for this burner are in locations where no natural or artificial gas is available and where bottled gas is costly or difficult to obtain. In some situations, the use of gas — particularly LP — is not permitted (such as military arsenals, ammunition dumps, etc., and some school and other institutional heating plants). For such purposes where the conventional electric-gas ignited burner is not permissible, the rotary burner designed for pressure burner ignition is the answer to the problem with little additional cost.—R. B. PLASS, Chief Engineer, Ray Oil Burner Co.

WARTIME STUDIES A PEACETIME ASSET

THE TIMELY PAPER by Captain Willmon on the Navy's air conditioning problems, in the September HPAC, emphasizes the limitations placed on the physical equipment by such factors as weight, size, quietness, etc.; lists some of the environmental factors such as CO_2, O_2 and CO concentrations where human tolerance sets the limiting levels; and mentions such factors as odors, temperatures, humidity and illumination — all of which may have psychological and resultant effects on performance and morale. About the only factor not included and the one which is always present in domestic comfort and industrial air conditioning is the one of economics or costs. This is rightly so, because in the military operations of the United States, human life and efficiency come first.

While the paper mentions some research areas in which work is going on, it also points indirectly to many other areas where numerous unsolved problems exist. Some of these problems have to do with physical equipment and some have to do with the biological effects of environmental factors on man. Although data collected in studying many of the specific military physical and biological air conditioning problems may be for immediate military application, undoubtedly much of the information will also be applicable to other problems, particularly in industrial air conditioning and the use of air conditioning in hospitals and in therapy.

The physical and personnel facilities made available to study the types of problems enumerated by Captain Willmon for military use in times of emergency can become a valuable peacetime asset of the sections of the medical and engineering professions which are concerned with domestic environmental problems.

This can be most fully realized if some of the programs are set up in qualified universities where interest in work of this type has been demonstrated over a number of years. Universities, with their diversified staffs and laboratories, and continuity of operations during both peacetime and wartime, if provided with the necessary specialized facilities, afford unequalled qualifications for carrying on both basic and applied research in many of the stimulating and challenging areas mentioned by Captain Willmon. He is to be commended for bringing these areas to our attention.—M. K. FAHNESTOCK, Research Professor, and Assistant Director, Engineering Experiment Station, University of Illinois. Member of HPAC's Board of Consulting and Contributing Editors.

A PAT ON THE BACK FOR INGENUITY

I ALWAYS FIND pleasure in reading of the inventiveness of man. Naturally, it is a pleasant surprise to read of a locale and persons with which one is acquainted.

I appreciate this opportunity to add a pat on the back to the Kellehers and my congratulations to HPAC for recognizing American inventiveness, as was done in the article in the September issue on the piping problem at our plant.—P. C. WALTHER, Industrial Engineering Section, Ford Motor Co.

BUSINESS IN MOTION

To our Colleagues in American Business . . .

The fact that a Revere Distributor is now celebrating its 125th anniversary year is an indication of the service the company has given its customers through those years. It is also another proof of the essential function performed by distributors for American industry. Most goods, whether industrial materials such as copper and copper alloys, aluminum alloys, iron and steel, or consumer articles such as refrigerators, radio and television receivers, kitchen utensils and ranges, go through the hands of distributors. Generally speaking, only the large buyers are in a position to purchase direct from manufacturers, who do not find it economical to handle the smaller orders. Yet those orders when pooled in the hands of an organization set up to handle them attain sizable totals, and hence a good distributor account is exceedingly attractive to a large manufacturer such as Revere.

A distributor serves not only the factories from which he buys. He also performs an invaluable service to his customers by making quickly available to them the products they require. A machine shop, for example, may need only a few hundred pounds of brass rod; there is a distributor within easy reach who can furnish it almost immediately. Or a contractor may want a few pieces of steel pipe and a thousand feet or so of copper water tube. Again, the distributor has them. A metal products distributor has to carry such items and an infinite number of others. The Revere Distributor who started in business 125 years ago actually has in stock 53,000 different items, cataloged, indexed, and held in warehouses ready for immediate shipment throughout its territory. Each month this stock is drawn upon by 5,000 to 8,000 customers, each order relatively small. There are many Revere Distributors with similar stocks and offering equal service.

To keep this distributor's warehouses filled with a balanced inventory, 18 people are required in his purchasing staff, which includes specialists in various kinds of materials, machines, tools and supplies. And to serve customers with information, quotations and the like, 25 salesmen are on the go constantly, calling on manufacturers, contractors, builders and stores throughout the busy industrial area in which the distributor operates. The large business done by the company is in great contrast to that of 125 years ago, when it was little more than a hardware store. The enterprise has grown in the American tradition of freedom to prosper in accordance with the principles of reliability and efficiency, fair dealing and integrity in performing a desired function.

Revere Distributors are selected for their ability to serve, and also chosen as to location, so that no matter where you are in this big country of ours, there is a Revere Distributor within easy reach. Today metal stocks may be short due to defense demands but manufacturers are doing everything possible to keep distributors supplied.

If you buy from distributors we suggest you remember that they are not only "central stockrooms," but have a great deal of special knowledge about the products they sell and can give you much helpful advice. Not only that, through the Revere Distributors you can be put in touch with the Revere Technical Advisory Service, which will cooperate with you on matters concerning the selection and fabrication of the Revere Metals. Our distributors, and those of every other manufacturer, render many essential services, both to those to whom they sell, and to those from whom they buy. The distributor system as it operates in the United States arose in response to the need for it. Today it fulfills that need more effectively than ever before.

REVERE COPPER AND BRASS INCORPORATED

Founded by Paul Revere in 1801

150 YEARS OF SERVING THE AMERICAN WAY

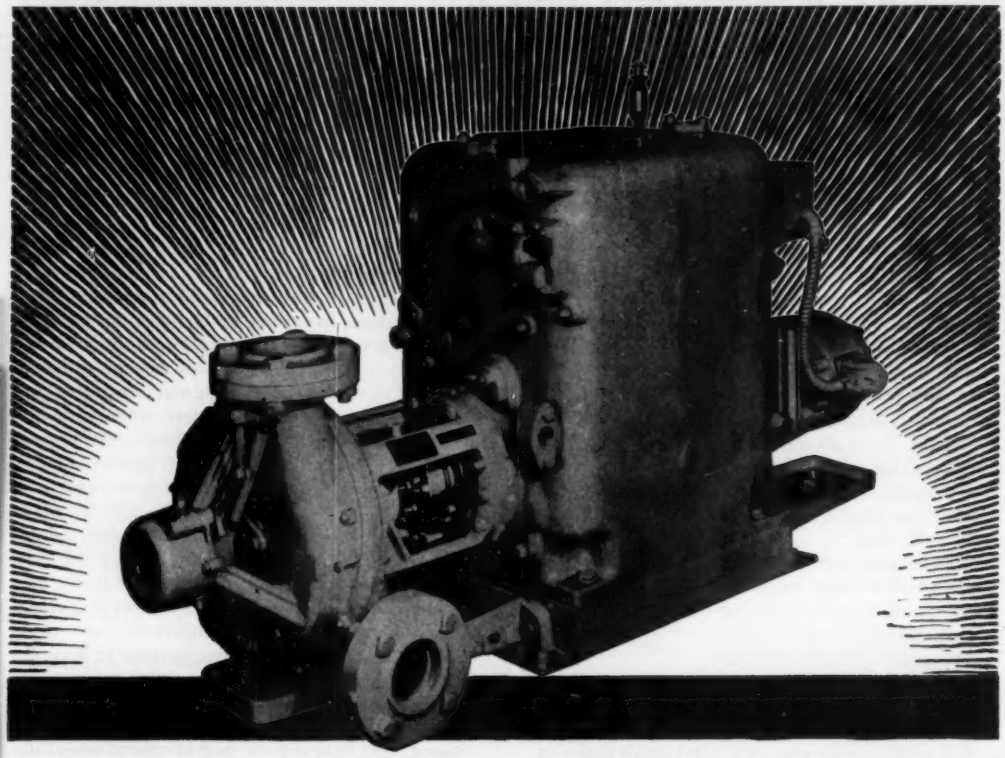
Executive Offices:

230 Park Avenue, New York 17, N. Y.

SEE "MEET THE PRESS" ON NBC TELEVISION EVERY SUNDAY

Safety!

THE NASH VAPOR TURBINE HEATING PUMP IS NOT STOPPED BY ELECTRIC CURRENT FAILURE



For service in greenhouses, hospitals, schools, theatres, and public buildings, where heat failure is a serious matter, the Nash Vapor Turbine Return Line Vacuum Heating pump should be specified, for this pump operates perfectly without electric current.

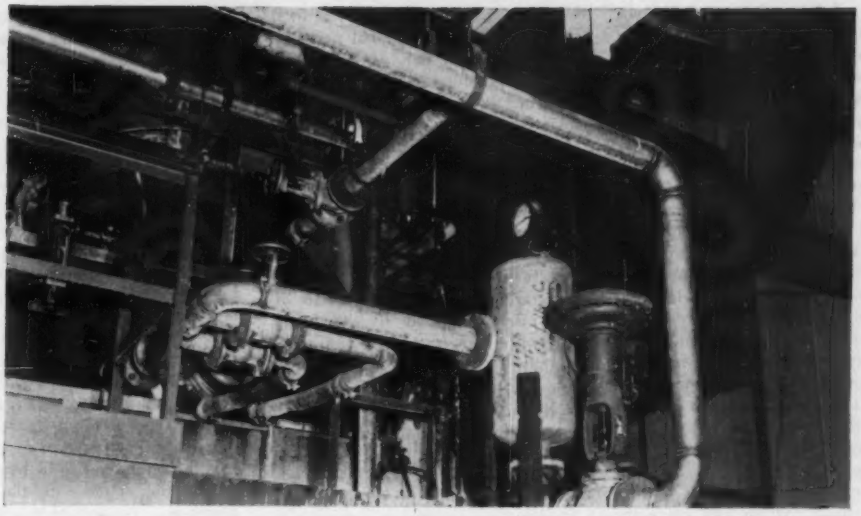
This is because the motive power is a special turbine operating on steam direct from the heating system. Steam used to drive the Vapor Turbine is returned to the system for heating, with little heat loss.

This pump insures constant heat in the system, it eliminates electric current cost, and it promotes high efficiency in the heating system. Heating efficiency is due to the fact that this pump can operate continuously with economy. Continuous operation means uniform circulation, and uniform conditions in the system mean steam saving.

This pump has but one moving part, no internal wearing parts, and requires no internal lubrication. Bulletin D-246 tells all about it, and it is free on request.

THE NASH ENGINEERING COMPANY

SOUTH NORWALK, CONNECTICUT, U. S. A.



PIPING MATERIALS for Chemical Processes

By Carl B. McLaughlin
Manager, Engineering Service Dept.
Tube Turns, Inc.

THE SERVICE temperatures to which piping materials referred to in this article may be safely subjected depend on the nature of the service conditions, the desired life of the piping and the hazard to human life and property involved in sudden failure. In selecting materials, it is the responsibility of the designer of the piping system to take into account all of the operating conditions affecting the adequacy of the piping material.

Allowable working stresses at various temperatures for most of the materials shown in the accompanying tables have been established by safety codes regulating piping and pressure vessel design. For such stresses, the design engineer is referred to the American Standards Association Code for Pressure Piping, the American Society of Mechanical Engineers Boiler Construction Code, the ASME Unfired Pressure Vessel Code, and the American Petroleum Institute-ASME Unfired Pressure Vessel Code.

In some cases the maximum temperatures for which such codes have established stresses are lower than the maximum temperatures given herein. In this connection it is well to make clear that the codes are not to be interpreted as implying that the materials for which they give stresses may be safely used under all service conditions within the temperature ranges they give, or that they cannot be safely employed beyond those temperature ranges. In other cases the tables herein show maximum temperatures considerably beyond those for which applicable codes may have established allowable working

Practical, timely, important and up-to-date . . . . . perhaps that's the quickest way to summarize this detailed discussion of material and other piping requirements for chemical process use. The author has included a great deal of helpful data, as well as 'straight-from-the-shoulder practical advice on piping problems and techniques. The effect of the present emergency on alloy materials is not neglected. This is an article for every piping design engineer, piping contractor, engineer in industry, and consulting engineer to read and to keep on file for reference

stresses. In these instances the tabulated temperatures are intended to indicate the extremes for which the manufacturers of the base metals list their physical properties or suitability as materials of construction, when such factors as rate of oxidation or other forms of deterioration become important. In any event, when it is desired to apply the materials herein covered in the form of pressure piping to services at temperatures beyond those for which the applicable code has established allowable working stresses, it is the designer's responsibility to apply to the code authority involved for a special ruling covering the specific conditions.

Two avenues of approach are open to the author of a technical paper of this kind. He can select a single phase of the subject and carefully list, analyze and discuss its various ramifications. Or he can cover the field broadly, thus reviewing certain useful data and developments that may have been overlooked by some of his readers. I have chosen the latter course.

Many and Varied Piping Problems

In no other industry, perhaps, does the piping engineer face as many and varied problems as in chemical processing. He must consider pressure provisions ranging all the way from, say, 110 psi external pressure to 33,000 psi internal. He must cope with temperature conditions as low as minus 420 F and as high as 1500 F or higher. He must take into account conditions of corrosion, erosion and contamination in the piping itself or from catalytic action of the pipe metal upon the product conveyed. At times, he is also faced with possible discoloration of product due to corrosion conditions in the pipe, or even changes in the state of the product caused by its being trapped in crevices within the piping.

Short as this summary of the general problem may be, it serves to illustrate the complexity of choosing the proper metal to fit a given set of conditions. It is my hope, however, that the following comments — plus the accompanying charts and illustrations — will prove helpful in arriving at satisfactory answers.

In our position as fabricators of alloy piping materials for industrial piping, we offer engineering service regarding the physical and mechanical application of our products. We are convinced, however, that the various primary metal manufacturers must render service where the evaluation of the corrosion resistance of their metal is concerned. It has been our experience that this is being done, and we urge that users of piping avail themselves of such information sources.

FIG. 1 — NOMINAL WALL THICKNESSES for welded and seamless stainless steel pipe

NOMINAL PIPE SIZE	OUTSIDE DIAMETER	NOMINAL WALL THICKNESS			
		SCHEDULE 5S*	SCHEDULE 10S**	SCHEDULE 40S**	SCHEDULE 80S**
1/2	0.840	0.065	0.083	0.109	0.147
3/4	1.050	0.065	0.083	0.113	0.154
1	1.315	0.065	0.109	0.133	0.179
1 1/4	1.660	0.065	0.109	0.140	0.191
1 1/2	1.900	0.065	0.109	0.145	0.200
2	2.375	0.065	0.109	0.154	0.218
2 1/2	2.875	0.083	0.120	0.203	0.276
3	3.500	0.083	0.120	0.216	0.300
3 1/2	4.000	0.083	0.120	0.226	0.318
4	4.500	0.083	0.120	0.237	0.337
5	5.563	0.109	0.134	0.258	0.375
6	6.625	0.109	0.134	0.280	0.432
8	8.625	0.109	0.148	0.322	0.500
10	10.750	0.134	0.165	0.365	0.500
12	12.750	0.165	0.180	0.375	0.500

* Nominal wall thicknesses for Schedule 5S pipe are not standardized. The thicknesses shown are those currently being used and were developed in cooperation with representatives of the various principal chemical companies and processing industries.

** Nominal wall thicknesses are standardized for Schedules 10S, 40S, and 80S and appear in American Standard B36.19, Stainless Steel Pipe.

Welding Affects Selection of Metal

It is my belief (based on experience) that practically all engineers in the chemical processing industry are requiring welding of the process piping. It seems necessary, therefore, that when you begin searching for a suitable piping material you must weigh each alloy with welding in mind. In other words, the alloy you select must be satisfactory in the "as-welded" state — a condition, by the way, that is true with a majority of this type of piping. Or, should that be impossible, you must realize that the piping has to be heat treated during and/or following the welding operation. Neglect of this vital step seems to be a common failing.

We have had many experiences that illustrate the point. A chemical company will often order piping material without giving much consideration to the effects of welding. Then it may come to us with the bill of material and, at that late stage in the game, ask if a particular type of alloy would be suitable.

For example, we received a wire from a customer who wanted some large flanges for 2500 psi nitric acid service at 600 F. He had selected 18-8 molybdenum, type 316, as the alloy required. In addition to asking for design details on the flanges, he wanted to know if the welds should be heat treated. From a leading source of corrosion information, we learned that recent tests with nitric acid at elevated temperatures indicated that type 316 stainless steel was inferior even to type 304. In view of this fact, it was recommended that our customer institute a testing program, especially since the operating temperature of 600 F exceeded any test data on file.

I think this incident fairly well illustrates just how far people can go without being aware of the information that is available.

Other Factors in Metal Selection

Quite often, several other factors bearing on the selection of a metal become important considerations.

For example, when it is essential to prevent a product from becoming

contaminated or discolored, many engineers turn to alloy materials for satisfactory and economical solutions to their problems. The passivity and chemical stability of the stainless steel, aluminum and nickel alloys are particularly suited to many applications in the paper, plastics and textile industries, and in the manufacture of paint and varnishes.

In many cases, the corrosion products of aluminum are colorless. They will not stain finished or unfinished textiles, nor adversely effect paints and varnishes.

Another factor that cannot be overlooked is the catalytic effect of certain metals upon various products. The details of this phenomenon are often revealed only after tests of sufficient duration to produce a change in the product conveyed have been made.

An interesting case in point is that of a distillery which reported that stainless steel equipment produced clouds in the whiskey. In fact, one engineer contended that in his plant the whiskey turned black as ink. Stainless steel was being used in place of tinned copper, the tin coating of which was subject to damage in service. In view of the well-known passivity of stainless steels, there was believed at first to be another reason for the clouding effect. However, the author has heard a sufficient number of reports to indicate that there must be some truth to the theory that stainless steel has a catalytic effect on whiskey. Recent use of inconel in this service has apparently solved the problem.

During the past two or three years, there has been formed what is known as the Chemical Industry Correlating Committee of the American Standards Association. Its function is to cooperate with the various committees establishing standards governing items the chemical industry purchases so that its requirements will receive proper consideration.

To date, the activities of this committee have been confined to pipe, valves and fittings and have resulted in the establishment of a standard for schedules 10S, 40S and 80S pipe. It is known as ASA B36.19-1949, covering stainless steel pipe. We shortly expect this standard to be expanded to include schedule 5S pipe. Attention is also called to the Manufacturers Standardization Society of the Valve and Fittings Industry MSS

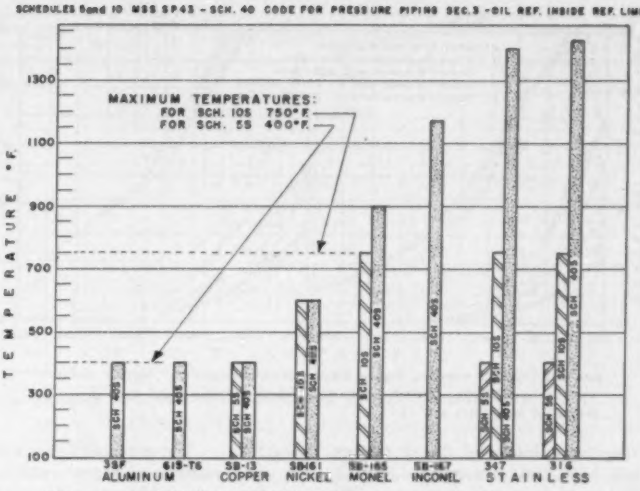


FIG. 2 — MAXIMUM TEMPERATURES at 100 psi working pressure for various wall thickness schedules of 4 in. pipe

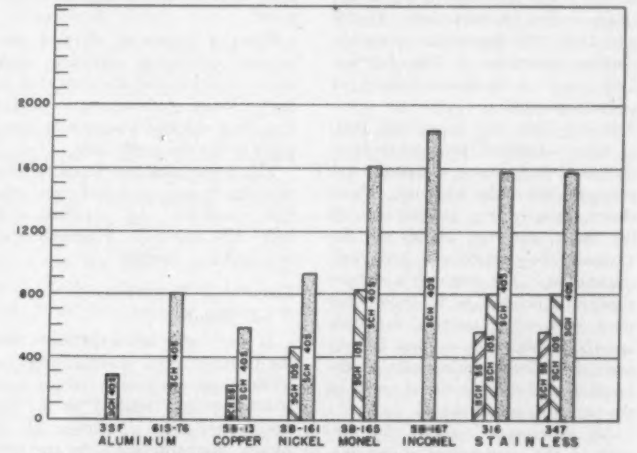


FIG. 3 — MAXIMUM ALLOWABLE WORKING PRESSURES, psi, at 250 F for 4 in. pipe of various schedules

Standard Practice SP-43, 1950 edition, which covers stainless steel butt welding fittings. In all probability, these standards will, in the near future, be extended to cover other alloys.

Fig. 1 shows the different thicknesses for schedules 5S, 10S, 40S and 80S. The latter three are established standards and the standard for 5S should be issued soon. Many helpful results are expected from the efforts of the Chemical Industry Correlating Committee through the simplification of the many items which are used by the chemical processing industry.

One of the most important characteristics of a metal to consider when making a selection is its stress-carrying ability under the operating temperature expected. In the piping field we have been confronted recently with temperatures as low as minus 420 F. We are continually urged to provide metals capable of withstanding temperatures as high as 1800 and 1900 F. Coping with such extreme temperature conditions, and with internal pressures up to 33,000 psi, requires that the piping engineer give serious thought to the selection of the proper metal and pipe wall thickness. In this connection, two charts

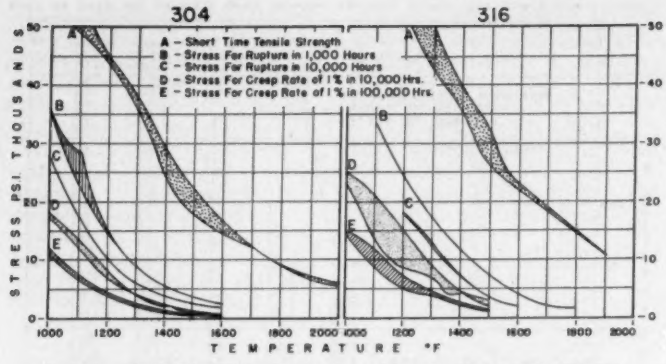

304
316
A – Short Time Tensile Strength
B – Stress For Rupture in 1,000 Hours
C – Stress For Rupture in 10,000 Hours
D – Stress For Creep Rate of 1% in 10,000 Hrs.
E – Stress For Creep Rate of 1% in 100,000 Hrs.
STRESS PSI THOUSANDS
TEMPERATURE °F
Reference : BABCOCK & WILCOX ; TIMKEN ROLLER BEARING ; U.S. STEEL ; METALS HANDBOOK

FIG. 4 — STRESS, CREEP AND STRESS RUPTURE conditions for stainless steel types 304 and 316

have been developed that I believe you will find interesting. Fig. 2 lists maximum temperatures at 100 psi working pressure for 4 in. pipe of the various schedules of wall thicknesses under consideration. Fig. 3 sets forth the maximum allowable working pressures at 250 deg for 4 in. pipe of various schedules of wall thicknesses.

It has been my experience that, in many chemical process applications, relatively low temperatures and pressures are in the majority. These charts, then, give a general idea of the stress carrying ability of the various alloy materials and wall thicknesses. The engineer's responsibility, I believe, is to choose the most economical material for each specific application, so that he will meet the safety requirements of the location and the functional needs of the piping system involved.

My experience indicates that several of the nonferrous piping materials have not been given proper consideration. There are probably two reasons for this. First is their relatively low strength (although reference to the charts shows this to have little effect upon their suitability for most service applications). The second is the general lack of knowledge among most engineers regarding the fabricating and mechanical characteristics of those materials. The advent of inert gas shielded arc type welding, however, has focused new interest on the ability of these alloys to do an outstanding job.

For very low temperatures — under minus 150 F, that is — only the aluminum, nickel, copper and stainless steel alloys can be used satisfactorily. The economics continue to draw attention to copper, and — more recently — the general interest in aluminum and its acceptance for these applications indicate a definite trend.

When it comes to elevated temperature problems, attention again shifts to nickel and stainless steel alloys. Many of them are so alloyed that their elevated temperature properties insure their selection.

Fig. 4 has been developed to illustrate the stress, creep and stress rupture conditions for stainless steel types 304 and 316. I am sure you will find it of interest.

Corrosion Properties of Metals

It has been my experience that the primary metal manufacturers are willing and anxious to cooperate in providing data relating to the corrosion resistant properties of the metals they produce. At the same time, however, I feel that users are either reluctant to take advantage of this service for fear of implied obligation to a certain company or, when seeking corrosion data, are often prone to give sketchy information regarding their problems. We all know that corrosion problems are exceedingly complex. It is obvious, then, that the more details the manufacturer's metallurgist or corrosion engineer has at his disposal, the more valuable to the user his advice will be.

Let us examine briefly the more obvious points of a corrosion problem in piping service:

1. Temperature.
2. Pressure.
3. Corroding medium and its concentration.
4. Presence of impurities.
5. Does corroding medium change in composition?
6. Velocity.
7. Erosion possibilities.
8. Wet and dry conditions.
9. Galvanic corrosion.
10. Presence of crevices and traps.
11. In what condition will the metal be used — as-welded, stress relieved, stabilized or annealed?

When it is endeavored to secure data regarding metal selection, therefore, the consultant should be given as much information as is available regarding the application so that a completely intelligent analysis can be made.

Also, let's remember specifically some of the main sources of information on corrosion of metals:

1. Stainless Steels — Stainless steel producers and their representatives; *International Nickel Co.; *Electro-Metallurgical Co.; (The companies marked with asterisks are not stainless steel producers but are excellent sources of stainless steel data.)
2. Nickel Alloys — International Nickel Co.
3. Aluminum Alloys — Aluminum Co. of America; Reynolds Metals Co.; Kaiser Aluminum & Chemical Corp.
4. Copper Alloys — Various copper tubing producers.

Valve manufacturers also provide useful data on alloys.

There is an unalterable fact that must be recognized — no responsibility can be assumed by these sources regarding their recommendations. A typical incident clearly illustrates why this is logical.

A manufacturer recently advised of plans to install piping to carry formaldehyde. Upon consulting the sources of information, I learned that aluminum was satisfactory if no formic acid were present. In answer to our question on this point, the customer replied: "Positively, no!" In a few minutes, however, he revised his opinion and admitted that a small amount of formic acid might be developed. It cannot be too heavily emphasized that a quality product made to our specifications is all that we can expect from the metal manufacturer. The design and selection of material is the responsibility of the design engineer.

No Substitute for Testing

This brings us to the next point: There is no substitute for a broad, intelligent and continuous testing program. Most of the larger user companies today have instituted such programs in their experimental departments. It has proved invaluable

to them in selecting the proper materials for their varied applications. Such a program must be approached on the basis outlined previously. All metals tested must be evaluated under conditions as closely approximating those of the actual installation as is possible. The factors to be considered, you will recall, were set forth earlier in connection with the details that should be given the consultant when trying to select the most economical metal for a given set of conditions.

Going hand in hand with this corrosion testing program, and equally important, are pilot plant operations designed to carry the test program a step further. This gives an opportunity to prove the conclusions. Admittedly, these steps leave something to be desired, since plant production conditions are very difficult to duplicate on a small scale. However, by going as far as is practical in determining the most economical and suitable alloy construction material, the user is prepared for handling a new process.

I feel sure we have all experienced the situation in which we are told by management to go ahead with "Project X," only to realize that the selection of materials has been left to chance. What is the answer when there is insufficient time for a thorough testing program? Actually, of course, there is no answer other than to collect available information and draw your conclusions based on the data so obtained.

TYPE NO.	CHROMIUM %	NICKEL %	OTHER ALLOYING ELEMENTS	SERVICE TEMPERATURE RANGE DEGREES F.
1. 304	18	8		-320 to 800
2. 304 ELC	18	8	.03 MAX. CARBON	-320 to 1500
3. 347	17	9	1% MAX. COLUMBIUM	-320 to 1500
4. 316	16	11	2-3% MOLYBDENUM *	-320 to 1500
5. 316 ELC	16	11	2-3% MOLYBDENUM .03 MAX. CARBON	-320 to 1500
6. 317			3-4% MOLYBDENUM	-320 to 1500
7. 321	17	9	0.60% MAX. TITANIUM	-320 to 1500
8. 309	25	12	*	-320 to 2100
9. 310	25	20	*	-320 to 2100

* COLUMBIUM IS SOMETIMES ADDED TO STABILIZE THESE ALLOYS

FIG. 6 — STAINLESS STEELS — service temperature range and alloying elements

Major Alloys Classified

Now let us take a brief look at the alloy field and discuss the classes which are finding considerable application in the chemical process industry. Fig. 5 shows the intermediate alloy steels which include carbon moly and intermediate chrome alloys with the chromium varying from ½ to 2¼ percent inclusive, the 5, 7 and 9 percent chrome moly alloys, and the 3½, 5 and 9 percent nickel alloys. In view of the fact that these intermediate alloys are used most widely in the power and oil refinery fields, we need not devote much time to them here. Of the nickel steels listed, the 3½ percent nickel steel is used for temperatures down to minus 150 F. Speaking generally, the welding characteristics of these alloys are good, provided the proper preheat and stress relieving practices are employed. Their tendency to air-harden from the welding temperatures, however, does necessitate more than normal care in fabrication. Competent fabricators should be employed to install piping classified in this group.

FIG. 5 — ALLOY STEELS — service range and applications

GRADE	SERVICE TEMP RANGE DEGREES FAHRENHEIT	GENERAL APPLICATION
1. CARBON ½% MOLYBDENUM	-20 to 1000 *	HIGH TEMP. STEAM & OIL
2. ½% CHROME ½% " "	-20 to 1050 *	HIGH TEMP. STEAM & OIL
3. 1% " ½% " "	-20 to 1050	HIGH TEMP. STEAM & OIL
4. 1¼% " ½% " " **	-20 to 1100	HIGH TEMP. STEAM & OIL
5. 2¼% " 1% " " **	-20 to 1200	HIGH TEMP. STEAM & OIL
6. 3% " 1% " " **	-20 to 1200	HIGH TEMP. STEAM & OIL
7. ¾% " ¾% Ni. ½% Cu.	-110 to 750	SUB ZERO SERVICE
8. 5% " ½% MOLY	-20 to 1200	HIGH TEMP. CORROSIVE SER.
9. 7% " ½% "	-20 to 1225	HIGH TEMP. CORROSIVE SER.
10. 9% " ½% "	-20 to 1300	HIGH TEMP. CORROSIVE SER.
11. 3½% NICKEL	-150 to 825	SUB ZERO SERVICE
12. 5% "	-150 to 825	SUB ZERO & CAUSTIC SER.
13. 9% "	-320 to 825	SUB ZERO & CAUSTIC SER.

* BEYOND 850° F. FOR CARBON MOLY AND 975° F. FOR ½ CHROME ½ MOLY GRAPHITIZATION MAY OCCUR.

** WHILE PRIMARILY USED BECAUSE OF THEIR HIGH TEMPERATURE PROPERTIES, THESE STEELS ALSO AFFORD SOME CORROSION RESISTANCE PARTICULARLY TO H_2S.

All of us, of course, realize the importance of stainless steels (Fig. 6) in present day design of chemical plants. The three most popular alloys are 18-8 type 304, 18-8 columbium type 347, and 18-8 moly type 316. Variations of these types are also used, but to a very small extent considering the footage erected. Piping, fittings and forged flanges are available in the entire family of stainless steels.

Generally speaking, these alloys can be satisfactorily welded by all of the usual welding methods. The metallic arc process is used for all except the lighter gages, for which the inert gas shielded arc method is becoming quite popular.

An important point to keep in mind is the susceptibility of these steels to carbide precipitation. In view of all that has been written on the subject, I have chosen to make only one precautionary comment: Be sure to analyze the steels from an as-welded standpoint. In many cases, one alloy would be suitable

in the unwelded state but not in the as-welded condition, and another alloy should be selected.

Preheating and stress relieving of these steels for general piping work are not necessary, with one exception.

GRADE	SERVICE TEMP RANGE
1 2S	-320 to 450
2 3S	-320 to 450
3 61S	-320 to 450
4 63S	-320 to 450

FIG. 7 — ALUMINUM AND ALUMINUM ALLOYS — service temperature range

When they are used in thicknesses of ½ in. or more, it is difficult to avoid cracking. No completely satisfactory solution to this problem has been found, but some welding engineers advocate preheating as high as 1000 F to mitigate this tendency.

Care should be taken to select the proper welding rod for each type of steel. As an example, I recently met a piping contractor who insisted upon using type 347 weld rod with type 316 on the mistaken assumption that this would minimize carbide precipitation of the metal involved. For this alloy, of course, type 316 weld rod should have been used. Gas welding is not recommended for the stainless steels.

The resistance of austenitic stainless steels to corrosion, plus their ability to retain their strength, ductility and scaling resistance at high temperatures and toughness in subzero applications, make them ideal for many types of service. Stainless steels also exhibit well-balanced characteristics at atmospheric temperatures.

Perhaps the next most widely used alloy material is aluminum. Aluminum and its alloys (Fig. 7) combine the advantages of high strength, light weight, good thermal conductivity, passivity in contact with many fluids, chemical resistance to many corrodents and relatively low cost. The most popular members of the family are the 3S-F and 61S-T6 analyses. The former is a relatively low strength, high purity alloy and the latter is a high strength, heat treatable type. Welding fittings in 3S-F material and forged flanges in both the 3S-F and 61S-T6 types are available. Fittings and flanges can also be made from the other alloys where special requirements so indicate.

Aluminum alloys have recently received considerable attention in view of their low temperature properties. The entire piping field, I believe, is interested in their possibilities as chemical process piping materials. They can be welded by either the oxy-hydrogen or inert gas shielded arc methods, although the latter is preferable because no flux is necessary. Type 3S is welded with 2S or 43S rod, and type 61S-T6 is welded with 43S weld rod. Preheat or stress relief is unnecessary.

Pure nickel and the nickel alloys (Fig. 8), most popular of which are "A" nickel and "L" nickel, are also receiving considerable attention in the piping field. Neither preheating nor stress relieving the welds is necessary with this group. Nickel is especially adapted to the handling of caustic solutions, but where acid salts and alkaline salts of an oxidizing nature are present it cannot be considered. Monel exhibits high resistance to salt water corrosion and good resistance to all acids except those of the oxidizing type. Inconel

GRADE	SERVICE TEMP RANGE
NICKEL	- 320 to 600
MONEL (67 Ni 30 Cu)	- 320 to 900
INCONEL (75 Ni 13.5 Cr)	- 320 to 1800
HASTELLOY "B"	- 320 to 1400
HASTELLOY "C"	- 320 to 2000

FIG. 8 — NICKEL AND NICKEL ALLOYS — service temperature range

is generally excellent although it, too, is affected by oxidizing acids. It is exceptionally strong, stubbornly resists oxidation at high temperatures and resists corrosion very well.

The preferred welding method for this class of alloys is the metallic arc process. A word of caution, however: The cleanliness of the material to be welded is of maximum importance. In some cases, carbon tetrachloride can be used to remove all grease, oil or dirt from the welding areas. The nickel alloys can be welded without diminishing their corrosion resistance if the job is done by an experienced welding operator who takes the necessary precautions.

With regard to copper (Fig. 9), the most popular of its alloys is deoxidized copper, which is used in considerable quantities by paper mills and distilleries. Silicon bronze, red and yellow brass, and the aluminum bronzes are also employed to some extent, although the difficulty of welding all but the first somewhat restricts their use.

Recent field reports, however, indicate that in addition to the oxy-acetylene and atomic hydrogen processes, the inert gas shielded arc method is gaining favor. Qualified piping shops throughout the country are welding these materials every day and there need be little hesitation in specifying welded joints of this material if competent workmanship is used in fabrication. No sacrifice in corrosion resistance is reported at or near the weld area.

Considerable brazing of these materials is also reported in the piping field.

The addition of alloys to copper improves its inherent resistance to specific types of corrosion. For this reason, admiralty bronze, red brass, copper-nickel and silicon bronze are being used in the chemical process field as piping materials. In some cases, complex preheating practices are followed and should be investigated before field welding these alloys.

Precautions When Handling Alloys

Before leaving this subject, I feel it is worthwhile to mention some of the precautions to be taken in handling any of these materials in the field:

1) Extreme care should be exercised to keep them clean because dirt, oils and grease of any kind will complicate the welding problem.

2) To avoid galvanic corrosion, it is well to specify that all parts (such as valves) coming into contact with the fluid in the piping system be constructed from the same alloy or class of alloys. There are specific exceptions to this, but each case should be analyzed carefully.

3) It is definitely recommended that no heating for bending be done in the field. Experience has shown

GRADE	SERVICE TEMP RANGE
1 DEOXIDIZED COPPER	-320 to 400
2 RED BRASS	-320 to 500
3 YELLOW BRASS	- 20 to 500
4 SILICON BRONZE	-320 to 350
5 ALUMINUM BRONZE	-320 to 550
6 70-30 COPPER NICKEL	-320 to 700

FIG. 9 — COPPER AND ALLOYS — service temperature range

that without competent metallurgical supervision, many difficulties can arise from improper heating or heat treatment following a heating operation. The practice of cold forming

these alloys without subsequent heat treating operations is questionable although, in some cases, it has been done and has proved satisfactory for the specific application involved. It is not generally favored, however, and care should be taken in performing any cold working operations in the field without a subsequent heat treatment.

4) Particularly with respect to the heat treatment of welds in stainless steel, the practice of completely heat treating piping assemblies is becoming a more important shop practice. Local heat treating of most of these alloy materials only complicates the problem. In general, it should not be done without considerable thought and consultation with the metal manufacturer.

Miscellaneous Construction Materials

I would like now to touch upon several alloys that have been brought to our attention recently. Piping components of these materials are definitely limited in availability so far as size is concerned, and careful check of that point would be worthwhile.

Carpenter No. 20 and aluminum bronze are being considered and used for some sulphuric acid applications and, of course, the hastelloy alloys are very satisfactory alloy constructional materials. The nickel-plated carbon steel materials are coated to a thickness of 0.008 in. (plus or minus 0.001 in.) The first welding pass is made with the alloy rod and the balance of the passes with mild steel rod. While the coating is rather thin for general service, the material has been used quite extensively in one of the government plants where it has been found entirely satisfactory. It also tends to reduce the overall installation cost.

In addition to the solid metals, our attention is continuously drawn to consideration of various lined materials. So far as the piping field is concerned, these linings consist of nickel, rubber, lead, glass or various plastics. Because of the wide interest focused on the plastics field, several companies offer plastic-lined steel piping materials. Recent discussions with several engineers in the chemical process industry regarding the potential market for these materials indicate that they feel a need for much development work before they will be satisfied regarding freedom from porosity, which is directly dependent upon the skill and ability of the applicator of the lining.

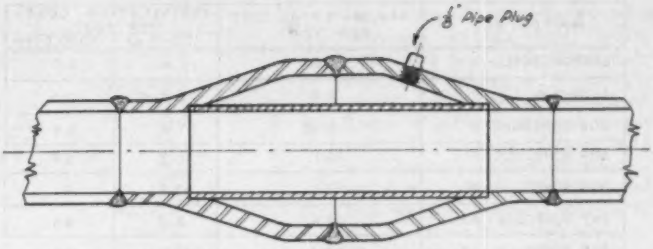


FIG. 10 — THIS INTERNALLY COATED PIPE JOINT is a solution to the problem of using a welded joint with lined piping

An interesting solution to the desire for a welded joint that can be used in conjunction with steel lined materials has been developed recently (Fig. 10). It involves the use of two reducers at each joint and an internal sleeve which has been lined prior to welding. A tapped hole in one of the reducers then permits complete filling of the cavity with lining material. Thus, the final welding operation will be far enough away from the sleeve; a satisfactory, continuous, corrosion resistant lining will result, and the benefit of a welded connection can be enjoyed. We are all viewing this development with interest to see what further work will do toward perfecting the application of the plastic lining.

Welding Costs for Alloys

The subject of the relative costs of alloy materials continues to receive much attention. Until recently, and possibly because the alloy piping field is relatively new, there has been very little factual information available for use. Lately, however, several articles containing very complete and useful data on the subject have appeared. In this paper, I have compared the data with other available facts, breaking the information down on a cost-per-foot basis. The comparison is based on 2 in. IPS, using black carbon steel of 2 in. IPS schedule 40. The various alloy materials are compared to carbon steel on the basis of carbon steel representing a value of 1. You will note in Fig. 11 that raw material cost-per-foot for the tubing is given, together with installation cost-per-foot based on strings of 100 ft and 1000 ft. The installation cost figures include the price of the pipe itself, labor, valves and hangers. They do not cover insulation. The many advantages of alloy piping materials, of course, will often more than justify their additional cost.

Another fact brought out by this comparison is that light gage tubing should be analyzed carefully before it is selected for use. The savings effected through its use become a minor factor in the price per foot, particularly for the long line. Therefore, good and sufficient reasons should be present for going to the lighter wall thicknesses.

It is the author's opinion that the welding labor cost of installing the various materials will vary only to a minor extent for all wall thicknesses except schedule 5. For that light wall pipe, the line-up and welding techniques become specialized and the cost of producing satisfactory welds is increased. Recent reports from several sources indicate that those who favor the use of schedule 5 have realized the difficulty in field welding sizes 2 in. and below. On their schedule 5 lines in that size range, they are presently substituting schedule 10. Bear in mind that this decision has been reached by companies experienced in the installation of this light gage material.

The study made to develop Fig. 11 again emphasized the danger of using approximate figures when considering this subject. It is certainly agreed that careful analysis of each system must be made before accurate installation costs can be developed.

Method of Fabricating Piping Systems

The ideal piping system, obviously, would be one in which no joints were necessary. This would eliminate all possibility of leakage and would provide a perfectly smooth interior surface without pockets, crevices or

MATERIAL	RAW MATERIAL COST PER FOOT	INSTALLATION COST PER FOOT	
		100 FT.**	1000 FT.***
CARBON STEEL	1.0	1.0	1.0
ALUMINUM	2.4	2.4	2.0
304 SCHEDULE 5	9.62	7.8	3.4
304 SCHEDULE 10	12.7	10.3	3.7
304 SCHEDULE 40	17.1	13.9	4.1
347 SCHEDULE 40	22.6	18.3	4.6
316 SCHEDULE 40	27.4	23.0	4.6
MONEL SCHEDULE 40	18.8	15.2	3.8
NICKEL SCHEDULE 10	15.9	12.9	3.3
NICKEL SCHEDULE 40	21.3	17.3	4.5

* REFERENCE 2" I.P.S. SCH. 40 CARBON STEEL
** 100 FT. STRING OF PIPE INCLUSIVE OF LABOR AND FLANGES AT 10 FT. INTERVALS.
*** 1000 FT. STRING OF PIPE CONTAINING ONE FITTING AND ONE VALVE INCLUSIVE OF MATERIAL AND LABOR.

FIG. 11 — RELATIVE COST of alloy piping materials as compared by the author to carbon steel

humps to trap the fluid or disturb its flow lines. Such an ideal system is not possible, of course, because of the various limitations placed on piping engineers. Let us, therefore, examine the types of joints that can be used and select, if possible, the one most closely approximating the ideal.

The author has had many experiences regarding the economical phases of this pipe joint study. The necessity for using materials and designs which reduce original installation cost figures is appreciated. However, I have seen many decisions made that appear shortsighted in that the thickness of the metal to be used, the fabrication techniques and the material specifications leave much to be desired from a safety and serviceability standpoint. With this in mind, careful study of all phases is urged so that when you have completed the piping system under consideration, your judgment will be a combination of economical considerations and proper engineering studies.

The following facts are well known in the field of corrosion resistant piping. Many alloy materials are being used today to prevent contamination of product either by pick-up of corrosion products of the pipe or entrapment of dirt or product within the pipe. The trapped product tends to change its chemical nature through stagnation, subsequently breaks away, and then contaminates the fresh material with which it comes in contact.

The second major problem confronting the piping engineer is the possibility of corrosion occurring in the small pockets or crevices that may form inside the piping system. This is known as cell corrosion. It usually results in pitting of the metal at the spots inside the system that are susceptible to product entrapment. The chemical changes that can result often cause difficulty.

With these two facts in mind — and I believe they are generally looked upon as problems of prime importance — let us examine the various types of joints. The engineer has a choice of the following kinds of connections: sanitary, socket welded, threaded, flanged or butt welded, with or without a welding ring (Fig. 12).

The threaded joint has very obvious disadvantages where corrosion or contamination is concerned. The exposed threads themselves are a potential threat; the natural crevices they form are an even greater danger. In addition, there exists a natural product trap beyond the threaded section itself. This is also true of the socket welded joint because the weld metal or silver solder does not normally fill all the crevices.

For the same reason, butt welding with a welding ring is not considered suitable by piping engineers. The clearance between the welding ring and the pipe's inside wall could cause trouble.

The sanitary joint is used extensively in the processed food and dairy fields, but is not generally considered for the chemical process industry. In the food and dairy fields, it is looked upon as essential in view of the sanitation standards set up by various state commissions which require complete cleaning of the piping system at regular intervals.

Because it represents the nearest approach to the ideal connection (no joint at all), the butt welded joint without welding ring is favored in the chemical process industry. However, care should be taken to secure full penetration of the weld metal. This will eliminate the possibility of crevices forming due to insufficient weld metal penetration.

Let's now consider the mechanical connections (Fig. 13) in the light of possible crevices and product traps. Two lap joint methods are widely used in the chemical industry. Surprisingly enough, the joint shown, which employs a stub end and has a large radius on the inside corner, is used more than occasionally. While this radius does permit the formation of a trap, the flow of fluid through the pipe evidently prevents entrapment of the product in some cases. It appears to the author, however, that a stub end with square corners would be more ideally suited for this purpose.

Trap formation is also true of the slip-on flange joint unless the pipe is carried through to the face of the flange, re-machined, and bored after welding. This is an expensive procedure, however, and we therefore find more people favoring the butt welded flange joint. Used with the welding neck flange, it not only offers the piping engineer great strength and fatigue life, but appears to be the flanged joint most closely approaching the ideal.

There is one other type of flange joint that might be mentioned: the modified Lovekin joint. Grooves are provided on the bore of the flange into which the straight pipe can be expanded. Personally, I've had little experience with it, but would be inclined to question the advisability of stretching the pipe or tubing to conform with these grooves because of the threat of stress corrosion.

"Tricks of the Piping Trade"

Now that we have briefly examined the general picture, I would

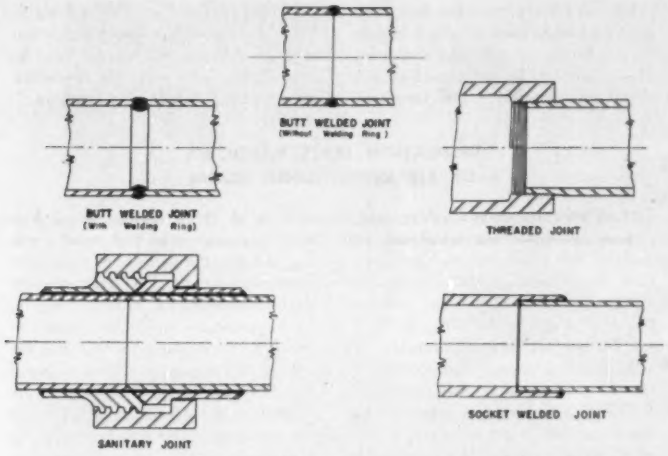


FIG. 12 — PIPE JOINING PRACTICES commented upon by the author in the text

like to discuss several "tricks of the trade," if you will, that are being used successfully and which might be of interest.

With the inert gas arc method of welding stainless steel, an undesirable oxide may form on the inside of the pipe. Effective elimination of this oxide can be accomplished by introducing a stream of helium or argon to the back side of the weld inside the pipe. This method will protect the weld from both sides.

One company which uses a considerable amount of corrosion piping has devised a method for reducing carbide precipitation when welding the nickel-chromium grades of stainless steel. They run the first pass very fast with small diameter welding rod, fill the joint with water and complete the weld with water inside the pipe. I have also witnessed an attempt to reduce carbide precipitation by actually playing water on the weld bead being placed by the welder. Reports on these two methods definitely indicate improved conditions, and I believe they will have a definite effect upon the extent of this phenomenon.

In the welding of aluminum piping, I strongly urge the use of a removable stainless steel backing ring. This ring is placed inside the pipe before welding and is easily removed after the weld is completed. There is no contamination of the weld. This practice has been tried with carefully engineered rings as well as simple strips of metal removed from lengths of pipe as long as 40 ft. The ID condition is excellent because sagging of the weld metal is prevented.

How Present Emergency Affects Alloys

I think it might be helpful to point out several complications arising out of the present international situation that have a bearing on our subject. As you probably know, the normal 18-8 type 347 analysis has become unavailable. The steel suppliers have advised me of the following facts, which might help understanding the reason for this.

In the normal ferro-columbium alloy, used as an addition to stainless steel, tantalum has always been an impurity. A typical analysis would be 40 percent iron, 55 percent columbium and 5 percent tantalum. In the past, therefore, we have been using an alloy that contained approximately 10 parts of tantalum for every 90 parts of columbium. This has not been a matter of common knowledge because commercial analyses reported columbium as being the total of columbium plus tantalum.

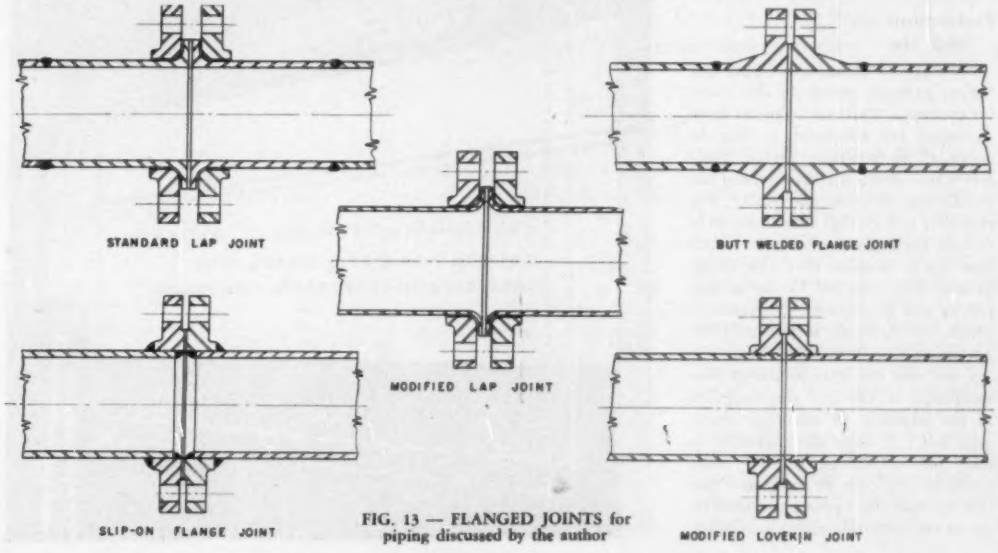


FIG. 13 — FLANGED JOINTS for piping discussed by the author

The above ferro-columbium alloy is now becoming scarce, forcing the use of an alloy with an analysis of 40 percent iron, 40 percent columbium, and 20 percent tantalum. This additional tantalum will probably force a change in specification from 10 times actual carbon minimum (1 percent maximum), to 11 or 12 times actual carbon minimum (1.35 percent maximum). The latter specification will be reported now as columbium plus tantalum.

I'm also told that tantalum is not as effective as columbium in insuring carbide stabilization, although it is just as effective in increasing creep strength.

Other substitutes that can be considered for the 347 analysis are extra low carbon type 304, reported as an alloy containing 0.03 maximum carbon, or 18-8 titanium type 321, which is not a popular alloy in the piping industry. Use of extra low carbon 304 in the piping field has been limited because, despite some statements, this analysis in piping materials is not readily available. Up to the present time, revised specifications for 18-8 columbium tantalum do not permit use of this alloy in the welding rod itself; 18-8 columbium welding rods must also be used when welding 18-8 titanium. I understand that welding rod manufacturers are supplying an extra low carbon type 304 rod that guarantees 0.04 maximum carbon in the weld deposit.

Restrictions on 18-8 Mo

Shortage of aluminum, nickel and copper primary metals is also cause for concern. Until such time as these shortages are alleviated, it may be necessary to postpone certain projects whose efficiency may depend upon the use of alloy materials. The suppliers tell me that they themselves do not know from month to month how much business they can accept beyond that required by the atomic energy and government programs — which are becoming increasingly important factors in the alloy field.

I feel that the facts presented here emphasize again the responsibility of the engineer in selecting piping materials. I urge all engineers to take full advantage of the many facilities available to interested parties through the various manufacturers of the materials under discussion. It has been my experience that engineers are sometimes reluctant to submit problems to the manufacturers. This is difficult for me to understand, as the manufacturers are very well informed and are not only willing to help, but have set up highly specialized departments whose sole responsibility is to serve the consumer by supplying detailed information.

INSULATION SEALS WINDOWS OF AIR CONDITIONED ROOM

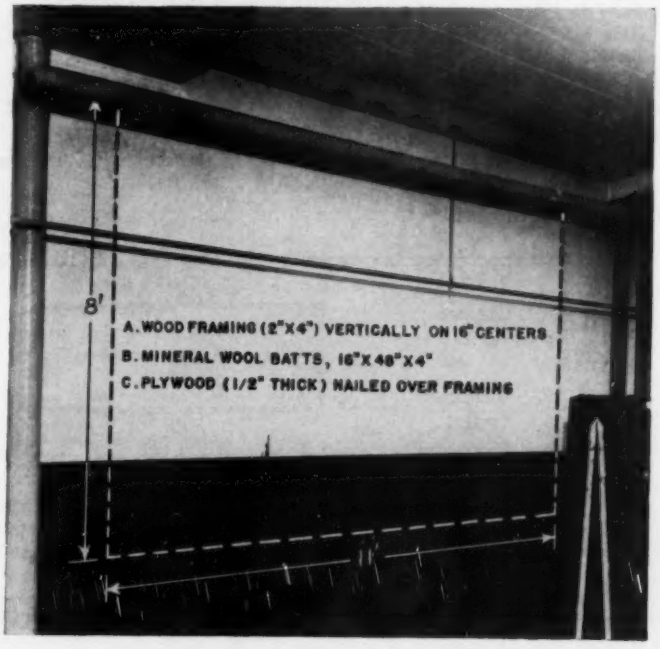
THE MINNEAPOLIS GAS CO. has sealed two opaque-glass windows with industrial batt insulation to help maintain the temperature and humidity of a new air conditioned proving room at a service building at 75 F and 50 percent relative humidity.

Installation of air conditioning in the 40 x 40 ft room, used for meter proving and maintenance, is expected to reduce an estimated 2 percent meter proving loss formerly caused by widely fluctuating temperatures and humidities. It was felt that heat leakage from outside through two 8 x 11 ft windows would put an excessive load on the air conditioning equipment and, therefore, that some means was necessary to cut heat transfer with as little additional construction as possible.

The window area is now insulated with 4 in. thick mineral wool batt sections installed in the wood framing and covered with ½ in. thick plywood and paint. The framing was first constructed by nailing 2 x 4 in. studs vertically on 16 in. centers to wood sections along the sill and the top of the windows. Mineral wool batts, in 15 x 48 in. sections, were placed in the 15 in. wide spaces in the framing. The paper overlap on the vertical edges of each batt section (which is covered with vaporproof paper) was nailed to the framing in order to hold the insulation securely in place. Plywood sheets, in 48 x 96 in. sections, were then nailed to the framing flush with the surrounding masonry.

The plywood was painted to blend with the existing walls.

TO REDUCE LOAD on air conditioning equipment serving room used for gas meter proving and maintenance, two large windows were sealed up permanently with mineral wool insulation



TYPICAL OFFICE VIEW shows some of the approximately 3000 window units which serve the exterior areas

Two Air Conditioning Schemes for New Pittsburgh Skyscraper

525 William Penn Place Corp. Building for Mellon Bank and U.S. Steel Has High Pressure Conduit Room Unit System To Care for Perimeter Areas and Interior Duct Distribution System for Interior Spaces or Core

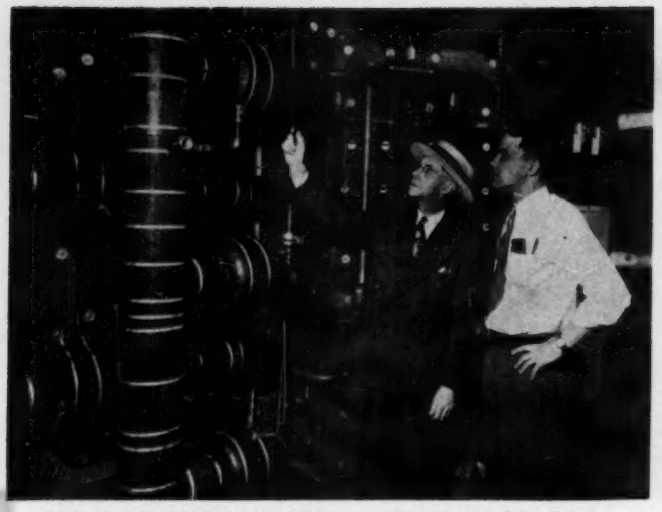
THE 525 WILLIAM PENN PLACE Corp. building, the new skyscraper towering 41 stories above Pittsburgh's famous "Golden Triangle," presents a stone and steel challenge to heat, cold, humidity and dust. The air conditioning system consists of "two lines of defense" — an outer ring and an inner bulwark — and is designed to stave off any attack of the elements.

A high pressure conduit system takes care of weather variations caused by sun and wind on the exterior of the building. It includes some 3000 individual units, one under every window. The second system compensates for heat gains or losses in the central or core area of the building by conditioning large volumes of air which is moved through sheet metal ducts.

The lower eight floors, the banking floor and two basements are to be used by the Mellon National Bank and Trust Co. The United States Steel Co. offices lease the rest of the building. Total occupancy is some 4200 persons.

2700 Hp for Refrigeration

An idea of the scope of the project can be gained from a few "statistics." Cooling capacity of the refrigeration equipment for the air conditioning system is equivalent to the melting effect of more than 5 million lb of ice daily. About 50 million lb of steam will be used annually. Some 16 miles of copper pipe and tubing and 13½ miles of steel pipe ranging in diameter from ¼ in. to 24 in. are needed to carry steam, condensate, hot water, chilled water, drainage and compressed air. Total capacity of all the fans that move air in the building amounts to 1,192,000 cfm. On a muggy day, the air conditioning system will remove from the air 11 gpm of water. The relative humidity will vary from 35 percent for winter operation to 50 percent during the summer.



ONE OF THE PLENUM CHAMBERS in which air is conditioned is inspected by George W. Strachan, project engineer for Dravo Corp., the heating, ventilating and air conditioning contractor, and Arthur Schock

The heart of the cooling system is in the third basement, where four big centrifugal compressors — three 300 hp and one 300 hp — provide refrigeration for chilling 105,000 gal of water each day. These machines are designed to chill the water from 54 to 40 deg. "Freon 11" is the refrigerant.

Air moving and conditioning equipment in the second basement serves the first eight floors of the building. The 15th floor houses similar equipment for the ninth through the 23rd floors. The 32nd floor contains equipment for the 24th through the 39th floors. The 40th and 41st floors are taken care of by a separate heating, ventilating and air conditioning system.

The Interior or "Core" System

The interior, or "core", system is designed essentially for cooling the year around — to offset heat gains caused by lighting fixtures, mechanical and electrical apparatus and building occupants. In this system, outdoor air is blended with recirculated air and introduced into cork insulated sheet metal chambers. Before mixing with recirculated air, outdoor air passes over steam coils which regulate its temperature. The blended air then flows through electrostatic air cleaners. Next, the air is drawn through glass fiber dry mechanical filters, and through a dehumidifier consisting of a bank of finned copper tubes through which chilled water is pumped. The air then flows through a set of eliminator plates, and finally through the big centrifugal fan into the interior duct distribution system.

At each floor, where the air enters a floor supply main, a set of reheating steam coils controlled by a zone thermostat provides accurate temperature control in the area. Supply ducts on each floor follow the corridors, discharging conditioned air into each office through grilled openings with adjustable louvers at ceiling height. Air is drawn back into the corridors through louvered openings in office panels or doors. Included in this return air is that supplied to the outer offices by the window units. Return air ducts are concealed in the false ceilings of the corridors and air is drawn into them through grille openings.

Large fans, located on equipment floors, pull air through the return ducts, and exhaust part or all of it depending on its temperature and humidity. The design of the exterior, or window unit, system is such that about one-half of the air supplied is recirculated air and the balance is air brought in from the outside. About five-eighths of the air supplied to the interior system is recirculated air and the remainder is air taken from the outside. The return air fan supplies air for recirculation to both exterior and interior systems.

Outdoor air to supply the fans in the second basement is brought in at upper floor levels through two large ducts with screened and louvered intakes. Exhaust air from the second basement is vented to the outside at upper levels. Outdoor air for the equipment on the 15th and 32nd floors is taken directly from the outside through louvered wall openings at the rear of fan plenums. Automatic dampers operated by air motors regulate the volume of outdoor and recirculated air supplied to the systems.

The Exterior Conduit System

The exterior or "skin" conditioning system is the one that compensates for varying wind, sun and temperature conditions so as to meet individual office needs. With this type of system, the temperature in each office can be regulated manually a few degrees to meet the desired comfort conditions of the occupants. Simultaneously, automatic controls level out temperature variations caused by bright sunshine, deep shade or wind on the outside rooms.

In this system, blended outdoor and recirculated air is induced into the fan plenum chamber where it passes in sequence through preheat coils, electrostatic filters, dry air filters, dehumidifier, reheat coils and finally the blower. This primary conditioned air, at a velocity of some 3000 fpm and under a pressure of 1 in. of water at the window units, travels through airtight small steel conduit to the individual rooms. Some five miles of the steel conduit is used in the system, with two conduit risers at every alternate building column.

The unit in each room consists of an attractively designed metal enclosure fitted into the wall under every window. Primary air from fans serving the floor is released into the room unit through small nozzles. In the front part of the unit are finned copper coils through which hot water flows during the winter and chilled water during the summer. Discharge of the high pressure air into the room sets up a gentle circulation which induces room air back into the unit over the coils. Regulat-

ing the flow of cool or hot water through the coils is the secret behind the individual room climate control. This is done by pneumatic thermostats, which actuate automatic valves in the secondary water lines.

Water for all the room units is conditioned at central stations in the second basement and on the 15th floor. Secondary water (which goes to the window units) is cooled as it is circulated through a heat exchanger consisting of a bundle of copper tubes in a larger diameter steel pipe jacket. Chilled primary water from the refrigeration equipment in the third basement is pumped through the steel jacket around the copper tubes. During the winter heating cycle, secondary water is pumped through another heat exchanger supplied with saturated steam at 10 lb per sq in.

As an economy measure, secondary water also is piped through a condensate cooler supplied with hot condensate from the heat exchanger and from preheat and reheat coils in the fan systems. This enables utilization of the heat content of the steam condensate which otherwise would be wasted. Secondary water is piped to the room units through risers at every alternate building column. All steam in the building is purchased from the Allegheny County Steam Heating Co. and piped into the building through a 24 in. main entering the first basement.

ERECTION OF PIPING was simplified by making many of the silver brazed joints at the bench and subsequently brazing the piping into position

Control Is Virtually 100 Percent Automatic

Control of the two systems is virtually 100 percent automatic. The room units are regulated thermostatically. The "core" system is controlled by zone temperature regulators. Valves operated by compressed air control water flow through the chillers and dehumidifiers at the central stations on the mechanical floors, based on temperature conditions of the air. Air motor operated dampers regulate the air distribution pattern.

Sun effect on the structure is compensated for through a master thermostat located on a model of the building which is erected on the roof. As the sun effect on the outside changes, the control will automatically reset all inside thermostats.

Water for condensing (7650 gpm) is cooled in a huge tower constructed in a two-story recess near the roof of the building. The cooling tower is 97 ft long, 25 ft wide, and 20 ft high, and is divided into four independent cells. Each cell is equipped with a 30 hp, four blade, stainless steel fan. Steel beams support a steel pan in which the tower is seated. Seasoned redwood fastened together with brass bolts and copper nails makes up the main body of the structure. [Photo on front cover.]

Because of the weight of the two 18 in. pipe risers that carry water up and down between the third basement to the cooling tower, the bases are cushioned on a solid block of heavily reinforced concrete 10 ft, 4 in. high, 6 ft, 7 in. wide and 8 ft long.

Snow Melting System for Sidewalks

A snow melting system that will keep the sidewalks around the structure free from ice and snow during the worst winter weather is another feature. Hot water, mixed with antifreeze, will be pumped through pipe coils buried in the sidewalk pavement to keep its temperature above freezing. The antifreeze solution for this system will be heated in a steam converter in the first basement.

Associated architects for the building are W. K. Harrison, M. Abramovitz of New York City and W. Y. Cocken of Pittsburgh. Consulting engineers for the heating, ventilating and air conditioning system are Meyer, Strong & Jones, New York City. Turner Construction Co. is general contractor. Dravo Corp., Pittsburgh, is the heating, ventilating and air conditioning contractor.

ISSUES WARNING ON RADIOACTIVE WASTES

THE POSSIBILITY of public exposure to radiation from radioactive wastes in the new atomic age is "an ever-present danger" which is being given increased attention by insurance safety engineers, the Association of Casualty and Surety Companies, 60 John St., New York 7, said last month in a special report (No. C-27) reviewing methods of disposing of radioactive materials in industrial wastes.

Hazardous exposures may occur among isotope users who are not strictly controlled now, and they should be advised of proper disposal methods and inspected carefully by insurance safety engineers when workmen's compensation, bodily injury or property damage forms of public liability insurance, and boiler and machinery insurance, are involved, says the report.

Particular care should be exercised when lines carrying even properly diluted radioactive wastes for disposal are repaired or replaced and when disposal equipment is cleaned or repaired, according to the report.

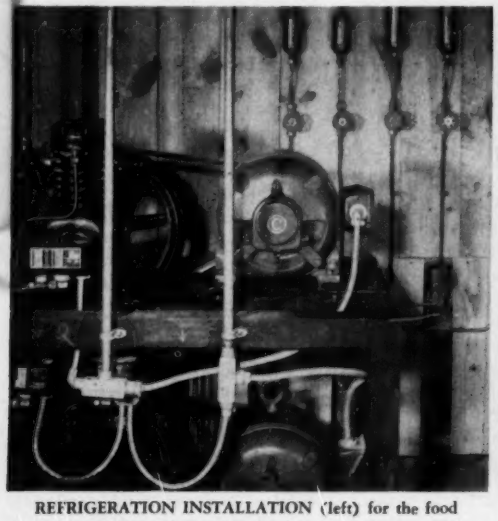
There is a "remote possibility" that in cases where waters contaminated with radioactive materials are used in boilers and other equipment, the equipment may become radioactive due to the precipitation of radioactive materials in boiler scale and the natural concentration of the solids in the boiler. This might hamper repairs or cleaning and cause a more serious loss under a use and occupancy coverage than would normally occur, the report states.

Heat Pumps Do Double Jobs

Furnish Both Heating, Cooling for Industrial and Other Uses

HEAT FROM FOOD COOLERS (left) in supermarket is disposed of in grid of copper tubing buried below basement floor. Large saving in cost of water otherwise required for condensing is thus made, and the heat from the grid helps keep the basement — which is used for storage — dry . . . . . ⅝ IN. OD TUBING WAS

BURIED (right) in wet clay 12 in. below the surface of the concrete floor in the basement of the supermarket. There is 6 in. of clean sand between floor and grid. This condenser cost about $1200 to install and the water saving the first year amounted to $750 as compared to metered city water



REFRIGERATION INSTALLATION (left) for the food coolers. High side condenser tubing goes into ground through floor. Return liquid lines with dehydrators lead direct to expansion valves of the various units. There is

no receiving tank, as the coils in the ground serve as the receiver . . . . . AT SAUSAGE PLANT (right), heat pump for process cooling supplies heat to radiant heating coils in floor of adjacent office and other areas

Henry E. Voegeli, Development Engineer, The American Brass Co., gives examples here of the utilization of both heating effect and cooling supplied by refrigeration systems of the "heat pump" type. In one case, an important water saving is made by a condenser grid buried in the ground — and in another, process heat is pumped to coils for heating offices with a floor panel

ENGINEERS, CONTRACTORS and owners of refrigeration and air conditioning equipment have been faced with a new problem in many localities where city water can no longer be used for cooling and then wasted to the sewer. In some cases, the problem is caused by a scarcity of water, and in others there is the danger of overloading storm and sanitary sewers.

A firm of contractors in Hartford, Conn., hit upon a solution that is somewhat akin to the evaporator coils that are buried in the earth for heat pump installations. The problem was to dispose of the heat from a 16 ton system of food coolers in a supermarket. The Charlton brothers, of Tempeco Refrigeration and Air Conditioning, laid out a system of copper tubing which was buried in wet clay 12 in. below the surface of the concrete floor in the basement of the supermarket. The grids of copper tubing are used as a condenser, and there is no auxiliary system for cooling. The tubes are $\frac{5}{8}$ in. OD, spaced 15 in. apart and in 100 ft lengths between headers. They carry "F-12 Freon" from the high sides of the several compressors. The system was designed to dissipate 40 Btu per hr per linear foot of tubing into the wet ground. This condenser required 5000 linear feet of tubing, occupying nearly three-fourths of the basement area. This installation has been in operation more than a year.

The condenser was installed at a cost of about $1200 and the owner estimates that he saved $750 in water rental the first year as compared with other supermarkets of similar size where metered city water is used for cooling.

An unforeseen advantage of this application is that the cartons of groceries and foods in the basement, which would ordinarily become damp and soft (even to the point of falling apart), remain dry and strong because the moisture in the ground below the basement floor is driven off by the warmth from the condenser grids. What is more, and which is made quite evident by a flooded area in a corner of the basement where there are no grids, the entire basement would probably be useless due to excessive ground water, if it were not for the year 'round operation of the underground condenser.

This application is not a "heat pump" job, as is ordinarily considered, but employs the same principles. A heat pump differs from an ordinary refrigerating installation only in that it is used for the heating effect rather than the cooling effect. The function of any refrigerating machine is to extract heat from one place and deliver it elsewhere — either to cool the first place, to heat the second place, or to do both.

Supplies Heating and Cooling in a Bakery

An example of a design for using both the heating and cooling effects of a refrigerating machine or heat pump installation is a bakery in Texas, which has a capacity of 6000 loaves of bread per hour. To cool the bread from a 205 F bake oven temperature to 90 F, and using 0.7 as the specific heat and the weight per loaf as 1 lb, it was calculated that a 50 ton heat pump installation would be required.

This process of cooling brings about a certain amount of condensation, particularly at the bottom of the loaves, which might cause sogginess and cause the bread to stick to the surface on which it lies. Heat is necessary to drive off this excess moisture, and the design provides that this heat be furnished from the high side of the same compressor or heat pump which does the cooling.

And in a Sausage Plant

Another installation making use of both the heating and cooling side of the heat pump is in a sausage plant. The heat from the frankfurts at 163 F is removed by refrigeration with the heat pump. First it is lowered to 150 F for coloring, then to 90 F and finally to 40 F before packing. The heat that is extracted from the cooler and delivered from the high side of the heat pump with "F-12" in the gaseous state is circulated through coils of copper tubing embedded in concrete slabs where it will furnish heat in winter for the offices and other rooms that are not actually used in the work of making sausages. In summer the heat will be delivered into the coils of copper tubing of an underground condenser below the basement floor. The capacity of this plant is about 6 tons. Some of the heat from the manufacture of sausages will be sent through the hot water storage tank where, if necessary, a booster will be installed to raise the temperature.

Conserves Fuel at a School

Another example of advanced thought is the 75 ton heat pump installation in a new commercial and technical school building under construction in Canada, where the heat pump will be employed for heating water for the showers and swimming pool using condensing coils immersed in two 1000 gal tanks. In summer the heat will be obtained from banks of coils mounted on frames on the roof of the school building, and in winter the heat will be extracted from the kitchen of the cafeteria and from the exhaust ducts of the ventilation system.

In a large school building such as this, or in any building for public assemblies, or where there are to be large gatherings of people, and where from four to six changes of air per hour are required, it should, under average conditions, be economical to reclaim the heat that has been put into the indoor air before exhausting the air from the ventilating system.

The enormous waste of heat in industry and the increasing cost of fuel — plus a diminishing supply — should engender advanced thought on the part of engineers to make greater use of similar ideas. The plain everyday refrigerating machine, or heat pump, is one of the very few machines that has ever been developed which renders a double service.

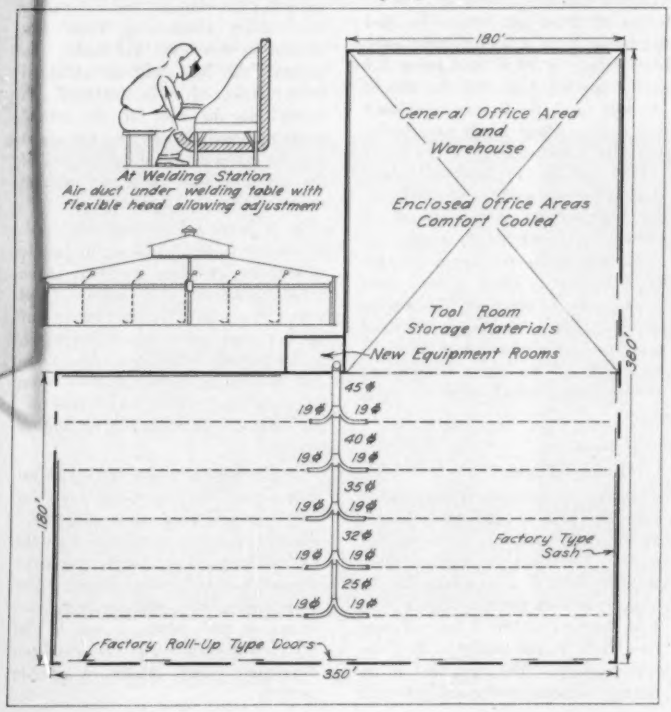
"Spot Cooling" Solves Tough Problem at 332 Welding Stations

By Will D. Sampson
Will D. Sampson & Associates

Air from a chemical dehumidifier is delivered through duct work to each of 332 welding stations in an industrial plant in the Gulf Coast area. The "spot cooling" thus provided has improved conditions and solved a number of problems

CHAMBERS OF COMMERCE are sometimes mighty touchy about how we talk about their weather, so we have omitted the name of the town in this article. Summer conditions exist there almost 12 months out of the year, however, and being on the Gulf Coast, where a high humidity prevails, you can well imagine how uncomfortable it can get. The job of welding carboloy tips on drill bits with an acetylene torch for 8 hr a day can be quite uncomfortable.

No "ultimatum" had as yet been delivered by labor, but the plant's management knew it was asking a great deal of the men to expect them to stick to the task under these trying conditions. Air conditioning engineers were therefore consulted to relieve a bad situation before it got worse.



This is a typical plant engaged in a steel fabrication project. Its dimensions are 180 ft wide by 350 ft long, with an ell 180 ft by 200 ft. The building has a corrugated steel roof, walls with about 60 percent glass in factory sash, and large roller type double doors. There is no insulation whatever. Where the roof meets the walls, there is about a 2 in. opening all around the entire building.

Just roughly — and not including product load, people, lights, motors, torches, etc. — such a building might require some 2000 tons of equipment to cool it 15 deg. This was not only out of the question from first cost alone but such an installation would run the cost of production so far above competition that sales would suffer.

Yet something had to be done to improve working conditions at the 332 welding stations.

"Spot cooling" of some kind seemed the most likely answer. There is very little information to be found on spot cooling of any nature and none, as far as I was able to determine, relative to this type of welding process. It was felt, however, that a dry air would be advisable. With this in mind, we designed a system based on removing latent heat only and with the sensible heat unchanged or slightly raised. The load is handled by chemical means and the air has a final temperature of 108 deg dry bulb and 68 deg wet bulb.

By experiment, we found that the operators could comfortably stand

an air stream directed at them with a velocity between 600 and 900 fpm.

At the temperature conditions stated and 900 fpm velocity, we can assume an effective temperature of approximately 81 deg. Ordinarily, this would not be too satisfactory — but under the circumstances of this installation, a lower temperature might result in physiological upsets.

Air Delivered Through Individual Nozzles

It was decided to circulate 100 cfm per station of dehumidified air, a total of 33,200 cfm. We then began the development of a grille or nozzle to deliver the air to the worker. The nozzle we used picks up about 300 cfm of secondary air, which means 400 cfm of air striking the man. This mixture of one part of primary to three parts of secondary air increases the effective temperature only to 83 deg.

The nozzle is attached to a semi-flexible tube, allowing the operator some latitude of adjustment in the direction of the air stream. The design of the duct work to all stations was standard for round pipe. No duct insulation was necessary, since no cooling is performed. A tempering coil was added for those few days during the winter months when the air might be too cool to use directly.

Noise being no problem, relatively high velocities are used, which result in a total static for the system of 2½ in. of water. An axial flow fan requiring 25 hp is used with a lithium chloride chemical dehumidifier.

There have been no ill effects from sore muscles or other such complaints. Production has risen considerably, since it is cooler at the stations than elsewhere in the plant. Absenteeism has dropped to an all-time low.

These factors, coupled with the fact that management did something for the employees without being forced, has produced better relations all around. Employee turnover is at a minimum, dropping the costs of training new employees. These benefits are all directly traceable to the "spot cooling system".

CHILLER DEHYDRATES AIRCRAFT INSTRUMENTS

A NOVEL USE FOR an industrial chilling machine has been reported by Lear, Inc., Grand Rapids, Mich. (aircraft and radio accessories manufacturer), according to the Sub-Zero Products Div. of the Deepfreeze Distributing Corp. To prevent "snowing" in aircraft instruments subjected to the low temperatures of high altitudes, the gases used to fill instrument cases are dehydrated in the minus 130 F temperature furnished by the unit.

Coils of copper tubing were installed in the cooling chamber of the chilling machine. The hydrogen and helium gases are forced through this tubing and quickly chilled to approximately minus 130. The water vapor in the gas condenses out in the form of ice crystals and fine snow. The condensate is trapped by filters before it can enter the supply line. The gases are warmed to room temperature before being used to fill the instruments.

The cooling coils are cleaned periodically by "reverse blowing" the ice and snow. Dry helium is used to purge the hydrogen coil and dry hydrogen to clean out the helium coil.

STATES STEEL NEEDS FOR BOILERS

THE MATERIAL REQUIREMENTS of the steel firebox industry for 1951 are set forth in a factual brochure recently published by the Steel Boiler Institute. The industry estimates its 1951 steel requirement will be 193,900 tons and an additional 10,500 tons of castings.

The well-illustrated brochure is a frank attempt on the part of the steel boiler manufacturers to bring into focus the "whys" and "wherefores" of their requirements for steel.

In the 12-page presentation, the steel boiler industry is depicted as nationwide in scope and represented by companies of small or medium size with large capital investments in heavy equipment.

Words and pictures explain what a steel firebox boiler is, what it does, where it is used and how it serves the defense program. Steel firebox boilers, the brochure points out, are needed to provide economical heat and process steam for commercial and industrial installations as well as heat and service hot water for institutional, apartment and other large buildings. Because of the need for greater capacities of heat and process steam in a defense economy, states the industry, steel boilers are essential. The brochure adds that replacement of unserviceable equipment, which amounts to 60 percent of the industry's total output, is an "important factor in conservation" since "new, more efficient boilers save up to 40 percent in fuel."

The brochure cautions that "even if all new building should suddenly stop," steel boilers would be needed "to replace worn and unserviceable boilers in existing buildings."

"LIVE" AIR FOR YOUNG CHICKS

AMONG THE HEATING methods introduced in recent years for the mass brooding of chicks and turkey poults, the combination vertical unit heater and adjustable air diffuser is apparently one of the most satisfactory and economical, according to the W. B. Connor Engineering Corp. Simple installation and relocation if necessary, full use of space, zone control, no hard-to-remove baked litter and minimum fire hazard are among the advantages.

The warm air discharged through the diffuser induces the space air to mix with it, setting up a gentle movement which imparts a "live" quality to the atmosphere.

Another important feature is the adjustability. For example, when it is desired to provide a 95 deg floor area temperature for starting young chicks, the diffuser is adjusted to force the air downward, thus creating a virtual hover. As the chicks mature and require more floor space and lower temperatures, the diffusion area is increased until it extends from wall to wall.

MOBILIZES FLOOD AID FROM 10-STATE AREA

THE GENERAL ELECTRIC CO. mobilized its service facilities in a 10-state area to help restore electric public services and industrial production in the Kansas City area, as soon as flood waters permitted.

H. F. McCullough, manager of GE's national group of service shops, stated that repair facilities in Kansas City, Houston, Dallas, St. Louis, Chicago, Cincinnati, Cleveland, Milwaukee and Minneapolis were called upon to help handle emergency flood repairs.

Emergency facilities, which virtually doubled the service shop facilities which have served that area for 35 years, were set up by service engineering people on the spot.

Using Mechanical Seals for Centrifugal Process Pumps

Dan R. Rankin, Chief Engineer, Peerless Pump Div., Food Machinery & Chemical Corp., points out that the use of seals on centrifugal pumps has grown rapidly in recent years. He discusses in some detail the application of pump seals, and gives practical advice on their proper use in industrial processes

RESTRICTING LEAKAGE around the rotating shafts of centrifugal pumps has been a major problem for design engineers and operating men since such pumps were introduced into industrial process service. For many years, efforts have been made to develop successful means of employing mechanical-type sealing elements. In some plants, discouraging experiences have resulted from the use of mechanical seals; in others, increasing numbers of mechanical seals are being used with success.

A greater understanding of the problems and characteristics of mechanical seals should be helpful both to those operating men who now think they are the answer to many of their problems and to those who have had adverse experiences.

Applications Numerous and Varied

Mechanical seals are operating satisfactorily in many process operations. Pumps handling light fractions in refineries — which formerly frequently looked as if the next "ice age" were here due to frosting of the stuffing box area because of evaporative cooling of leaking liquids — now operate smoothly with no indication of appreciable loss of the light material handled. Units pumping slurries will run for months before requiring replacement of seal faces with abrasive resistant seal designs. Processes where extremely high suction pressures require throttle bushings and bleed-back lines, representing appreciable loss of the product, back to the low pressure containers have been equipped with balanced seals which successfully do the job week in and week out.

In a field very different from the process industries and where cost is a prime consideration and operation experience is nil, mechanical seals are used on thousands of domestic water system pumps. The high volume of domestic water pumps built with mechanical shaft seals has brought the price of seals down so these pumps require no premium in price for a mechanical seal.

If seals can solve the tough jobs and can also be used on the cheapest types of pumps sold in great volume, there is every reason to believe that as time passes, pumps between these two extremes will be built specifically for mechanical seals.

In our experience, there is no entirely satisfactory mechanical seal for process services where temperatures of the seal exceed 450 F. Mechanical seals have resilient components made from a variety of synthetic materials, with unique properties as required for the particular service. Normal low cost oil resistant synthetics cannot be used for continuous operation in excess of 250 F, and it is necessary to go to special materials for temperatures approaching 450 F. Devices have been developed to maintain the fluid next to the seals below these critical temperatures by cooling the fluid adjacent to the seal so that liquids appreciably greater than the maximum temperature stated above can be pumped.

There is nothing definitely in sight today indicating that seals will be available for temperatures above 450 F, which leaves an important gap uncovered by mechanical seals at present. However, projecting the rapid progress which has been made in synthetic materials over the past 10 years, it is reasonable to assume that resilient materials may be developed for use in temperatures up to 800 to 850 F in the near future. It is also possible that seal designs which eliminate the critical resilient elements will be developed.

Like the Little Girl With a Curl

A seal is very much like the little girl who had the curl down the middle of her forehead — "when they are good they are very, very good, but when they are bad they are horrid". If a seal ring cracks, the leakage can be much greater than would develop from worn packing — and no warning of failure is given. It is also not uncommon to take a pump off the line, rework the seal and put it back in service, only to find that the seal was improperly assembled.

If, in trying seals for the first time, the operator has such an experience, he may very well rule out seals from his plant operation. On the other hand, if he has good experience with the first seals and is able to lick a job which previously gave him a lot of trouble, he thinks very differently about seals.

Few operators who have used seals extensively have not had some trouble getting them going initially. However, if the backlog of their experience indicates to them that once the seal is operating it normally will go a long time before maintenance is required, they are perfectly willing

to accept the occasional idiosyncrasies of this type of mechanical shaft sealing device.

As maintenance men become more experienced in handling and understanding them, seals do a better job and become more widely accepted throughout the process industries.

Realizing that one of the big problems in a process plant is to get a pump back on the line if a seal fails, some seals are built up in cartridge form, which permits them to be checked on test prior to installation on the pump. When this is done, the critical lapped wearing faces and "O" ring resilient elements do not need to be disturbed when installing the seal on the pumping unit. The only joints which have to be made are between the sleeve and the shaft and between the flange and the pump housing, so that there is normally very little chance of the seal not working when it is put into the line if it has not been tampered with prior to installing.

Design Pumps for Mechanical Seals

As mechanical seals prove themselves in various applications, more pumps are designed specifically for use with them. A pump designed specifically for use with a seal is a different machine than is a pump designed for packing and with a seal added later. Since seal face rings must be installed over the end of the shaft, it is not possible to work on a seal without removing the pump impeller. Thus, the working area behind the packing container and the bearing of the pump is not required when seals are used.

The length of a mechanical seal is normally appreciably less than that of packing. Thus, a pump designed specifically for a seal has the impeller much closer to the pump bearing, reducing the shaft deflection due to runout or side forces developed by hydraulic thrust on the impeller, as shown by Fig. 1. It is also less expensive to manufacture a pump specifically for a seal than to make a pump for packing and later adapt it for seal usage. Thus, it is desirable for a pump to be specifically designed for seals rather than to adapt seals to existing designs.

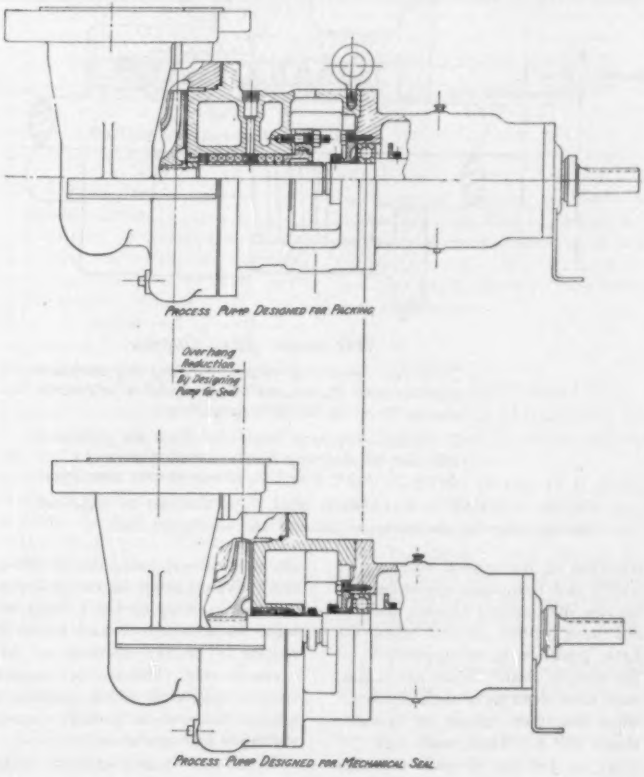
Many users have specified seals on pumps so constructed that packing can be used in case the seal does not operate properly. This is a case of straddling the fence, and the seal is not given every opportunity to succeed. If the engineers and operators cannot convince themselves that a seal is correct for the application, then it would be better to forget its use. If a seal is indicated, it should be given every chance by having the pump correctly designed for the best possible seal. Frequently, a well-designed balanced seal will require more radial space than conventional packing but will not require as much depth. Thus, it is often desirable to bore out the packing box or machine it off to permit a satisfactory installation. This cannot be done if the original packing dimensions are maintained.

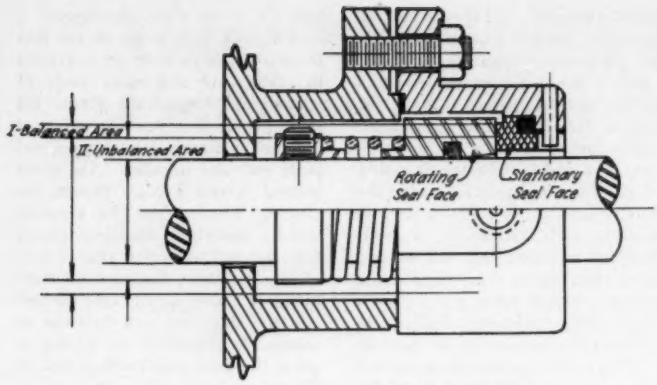
In purchasing a pump with a mechanical seal, it is just as important to see that the pump construction is such that it is easy to replace the seal as it is when purchasing a stuffing box type pump to see that there is ample room to get in around the shaft and add more rings of packing or to repack the pump. On some pumps it is possible to get at the seal by simply removing an end plate and the impeller. On many general service process pumps, the rotating element can be removed without disturbing discharge piping and the seal removed after taking off the impeller. However, on some pumps it is necessary to take the unit into the shop and pull bearings or completely disconnect the piping to get at the parts which will permit replacement of the seal.

Differences Between Various Seal Types

It is important to recognize the differences in the various types of mechanical seals. The basic con-

FIG. 1 — A PUMP DESIGNED specifically for use with a seal is a different machine than is a pump designed for packing and with a seal added later

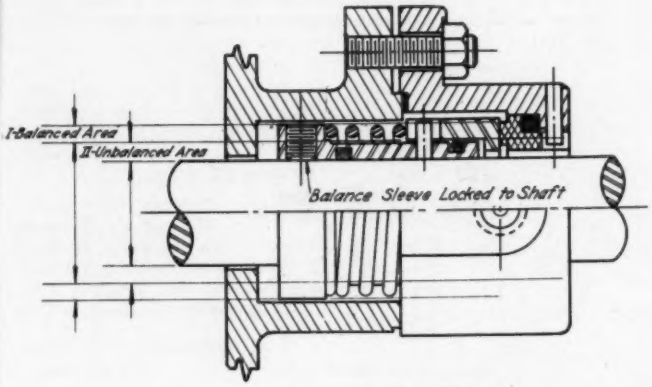

Process Pump Designed for Packing
Overhang Reduction By Designing Pump for Seal
Process Pump Designed for Mechanical Seal



UNBALANCED SEAL DESIGN

I-Forces resulting from stuffing box pressure applied over Balanced Area equal to pressure forces tending to separate faces

II-Forces resulting from stuffing box pressure applied over Unbalanced Area carried by seal faces acting as a thrust bearing



BALANCED SEAL DESIGN

I-Forces resulting from stuffing box pressure applied over Balanced Area equal to pressure forces tending to separate faces

II-Forces resulting from stuffing box pressure applied to Balance Sleeve which transmits force through shaft to pump thrust bearings

FIG. 2 — WHAT A BALANCED SEAL is is indicated by these two drawings, showing the forces on balanced and unbalanced seals

struction of mechanical seals varies widely and frequently operating men become discouraged because they do not have initial success when the basic problem is misapplication of the type of seal. Some mechanical seals have elements of such characteristics that they cannot be operated above 250 F. Thus, seals with "O" rings or bellows of such materials can be used only below that temperature. When using higher temperature materials up to 450 F, seals become more expensive and normally require a greater diameter — because usually chevrons or tapered wedges are used which require a greater diameter to provide correct resilience and operation.

Most seal manufacturers make both unbalanced and balanced seals. Unbalanced seals are less expensive, usually are not made in cartridge form so that they are pre-tested, and should not be used where the pressure on the seal exceeds the manufacturer's rating. When unbalanced seals are used at pressures in excess of 75 lb differential across the seal, the life of the seal is appreciably reduced and normally unbalanced seals should not be used at pressures above 125 lb even for intermittent operation as the faces may gall, particularly with poor lubricating fluid being handled in the pump.

A balanced seal is so designed that the pressure between its wearing faces remains essentially constant over a wide range of pressures on the seal. With properly balanced seals, it is possible to go up to virtually any pressure and obtain excellent life. Standard balanced seals can be used for pressures of 400 to 600 lb per sq in. without special consideration, but for pressure in excess of this it is wise to make sure that the seal manufacturer is familiar with the requirements so he will in turn make certain that the seal is properly balanced for the required operating range. Obviously, the requirement that the stuffing box pressure be maintained on the packing gland is not necessary when balanced mechanical seals are used.

What Is a Balanced Seal?

Engineers and operating men frequently ask: "What does it mean when you say balanced seals"? Fig. 2 indicates the forces on balanced and unbalanced seals. Essentially, on an unbalanced seal, the force resulting from the pressure on the rotating ring is carried by the seal faces acting as a thrust bearing. On a balanced seal, most of the force which was carried by the seal faces is taken by a sleeve firmly attached to the pump shaft transmitting the unbalanced force to the pump thrust bearing. The diameter of the rotating ring in relation to this sleeve is so adjusted that there is as much pressure between the faces of the seal tending to open them as there is behind the rotating ring tending to close the faces.

Exactly what happens between the seal faces is of no particular practical interest here. However, it is not a linear pressure drop and is not al-

ways the same for different fluids. The best way to balance a seal is simply to vary the diameter of the faces and operate the seal under a wide range of pressures and measure the heating of the seal and power consumption of the driver. On an unbalanced seal the power consumption will go up directly with the pressure, as would be expected, with a given friction coefficient and increasing load. With a balanced seal, the power consumption to drive the seal goes up very slowly as the pressure is increased over a wide range, indicating that it is very nearly in balance. Normally, it is desirable to have the seal slightly unbalanced so it will tend to close as the pressure increases to prevent the seal from opening on a pressure surge, but that at no time over the pressure range does it exceed the proper bearing unit pressure between the seal faces.

On light hydrocarbons where relatively high suction pressures exist, and on applications where poor lubrication quality exists in the fluid pumped, it is desirable to use balanced seals. Many users standardize on balanced seals because then they do not need to worry if the pump with the seal is transferred to a different operation with higher suction pressures.

Determining If Seal Will Do the Job

Often it is important to verify that a seal can be used to handle a particularly "tough" fluid, but operators hesitate to experiment on pumps in the process because of their relationship to the operation as a whole.

It is relatively inexpensive to build a testing device which will permit circulation of a fluid being pumped at the temperature of the process through a dummy pot and operation of the seal of the actual size and at the speed of the pump to determine whether or not the materials used and faces are correct for the application. This same test apparatus can be used to check cartridge type seals before they are put in warehouse stock (if the maintenance department wishes to repair seals on this basis.) Such a testing apparatus, which can be used either in the maintenance shop or in connection with the application of seals to pumps in the field, is illustrated in Fig. 3. Small operators can often borrow such a test apparatus from a seal manufacturer if there is a specific problem which it is wished to test without disturbing a process other than to put in a bypass line.

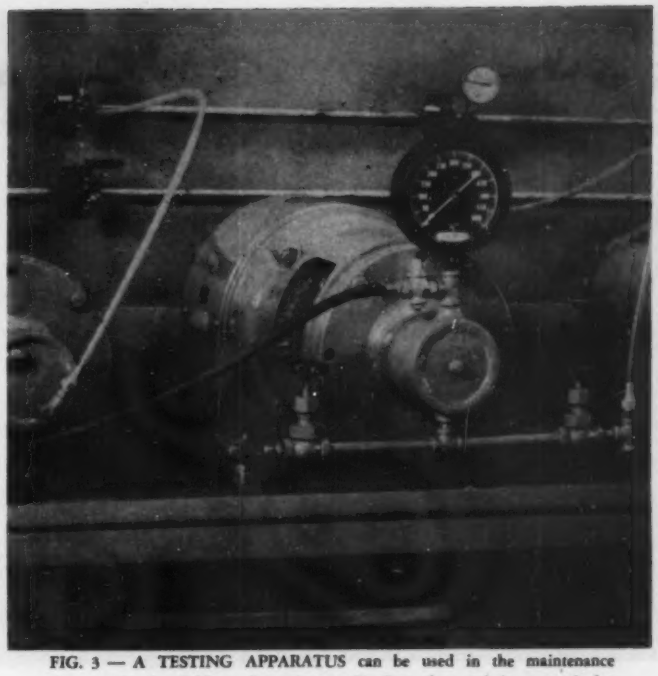


FIG. 3 — A TESTING APPARATUS can be used in the maintenance shop or in the field to determine application of a seal in a particular process without disturbing the process other than by putting in a bypass

The Use of Double Seals

A number of years ago, double seals were used wherever the pressures exceeded those which were usable under unbalanced seal conditions. A double seal consists of a seal mounted next to a pump impeller and another one at the bearing end of the stuffing box, with fluid at a pressure normally above that of the pump suction inserted between the two seals. Usually this requires a separate source of pressure to put oil or similar fluid between the seals and increases the cost and complications of the installation. This type of installation has also been used to some extent where abrasives are present in the fluid pumped, under the theory that with the pressure higher between the double seals than in the suction area of the pump, clean fluid — rather than the fluid containing abrasives — will flow through the seals.

With further advances in balancing seals and in providing wearing faces which are extremely resistant to abrasion, the double seal is rapidly being replaced. It is still used in some places where extremely hazardous fluids are being pumped and the chamber between the seals is flushed with the fluid to control any leakage and give indication of failure of the inner seal. However, there are few jobs which cannot be done today with a single seal.

And In Conclusion

In summary, let it be said that:

1) The number of seals used on centrifugal pumps has grown rapidly in the past 10 years.

2) Seals are limited to temperatures below 250 F with standard materials and 450 F with special ones.

3) Unbalanced seals should be used for fluids with good lubricating qualities up to 75 psi and balanced seals should be used for higher pressures.

4) For best results, pumps should be designed specifically for seals.

5) Users should make sure the proper type and material of seal is used for each application.

CANOPY OVER THIS COOKING AREA removes heat, fumes, grease and odors and reduces load on kitchen's air conditioning installation. Canopy has bank of cleanable air filters for grease removal

Separate Air Conditioning System Serves Cafeteria Kitchen

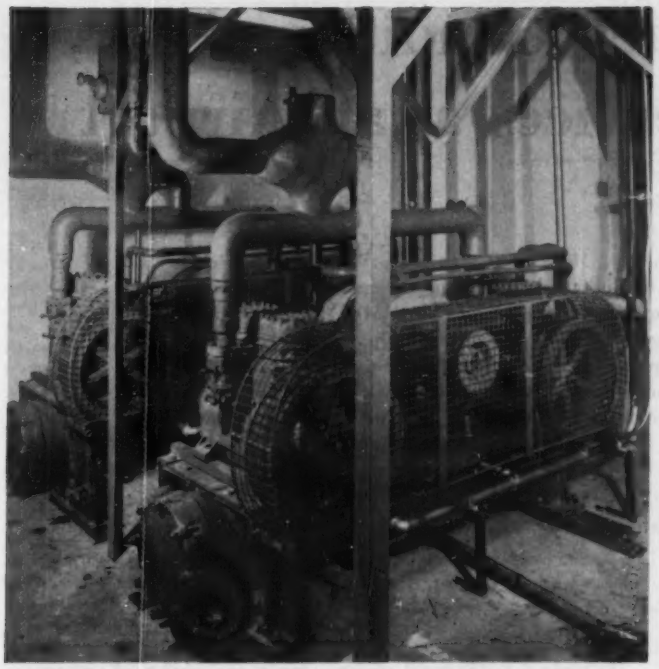
Two 20 hp compressors provide 45 tons of refrigeration for maintaining 78 F and 50 percent relative humidity in kitchen area of industrial employee cafeteria. Exhaust hoods remove sensible and latent heat and food odors

THE FRIGIDAIRE DIV. of General Motors Corp., Dayton, Ohio, recently opened an air conditioned, industrial employee cafeteria which is claimed to be one of the most modern of its kind. It is capable of handling a normal load of 5000 employee meals each day, and in case of need 20,000 meals could be served in a 24 hr period.

In addition to the air conditioning system for the dining area, there is a separate system providing air conditioning for the big kitchen.

The kitchen is divided into three semi-enclosed sections — the main chef's kitchen, the salad room and the baking or pastry room. This whole area is kept free of smoke, cooking odors and heat by the conditioning system. Employee efficiency is thus increased and the kitchen itself is kept much cleaner at all times than would otherwise be the case. A machine room housing the air conditioning equipment is separate from the kitchen area.

The conditioning system for the kitchen has such capacity that a design condition of approximately 78 F dry bulb and 50 percent relative humidity is not exceeded on an average peak day. A temperature of 75 to 76 F is usually maintained on normal operating days. However, the temperature may rise above the



THESE TWO 20 HP COMPRESSORS provide refrigeration for air conditioning the kitchen area. Eight other 20 hp compressors serve the dining room

desired 75 deg on days when a large portion of the kitchen equipment is in operation. Outside design conditions are 95 F dry bulb and 76 F wet bulb.

45 Tons of Refrigeration for Kitchen Area

In determining the air conditioning load in the kitchen area, the usual problems in comfort conditioning were encountered. However, special attention was given to the high sensible and latent heat gains due to the all-electric cooking and baking equipment as well as the high concentration of food odors.

An exhaust hood with an 88 ft perimeter is installed over the heat generating equipment in the kitchen, and there is an exhaust hood with a 38 ft perimeter over the heat generating equipment in the baking area. Each hood is equipped with an exhaust fan.

The amount of air needed for exhaust purposes was determined from the perimeter of the hoods (50 cfm per ft of perimeter), and totals 6300 cfm. However, the fans were selected to exhaust a slightly higher air quantity to create a small negative pressure in the kitchen area, the purpose being to draw some of the ventilation air from the air conditioned cafeteria to prevent kitchen odors from filtering into the eating and serving areas.

The amount of cooling needed to condition the kitchen area (from the outside design conditions to the inside design conditions) requires approximately 45 tons of refrigeration with 6300 cfm outside air. Using a minimum of 6300 cfm gives slightly less than a three minute air change in the kitchen space.

Temperature and Humidity Controlled

With the load determined, a central system air conditioner with a multi-path, six row cooling coil was selected — along with two 20 hp water cooled compressors. A nonfreeze preheating coil was installed in the outside air intake and a standard two row heating coil was placed in the air conditioner.

The grilles are of the double deflection type, with volume controllers.

The dry bulb temperature is controlled by a standard dry bulb thermostat which is used for both winter and summer operation. The thermostat is on the wall between the kitchen and the bake shop.

A humidity controller is also installed on the wall between the kitchen and bake shop. This control is needed in this space since, on muggy days when the dry bulb temperature is low and with the large radiant load, high humidities would be encountered. The humidity controller governs the operation of the two compressors as does the dry bulb thermostat. When a humidity build-up is encountered, the humidistat actuates the compressors so that they continue to run even though the dry bulb temperature has been satisfied. The thermostat actuates a steam valve in the line to the heating coil in the air conditioner which reheats the conditioned air to the desired dry bulb temperature, thus satisfying the dry bulb temperature as well as controlling the humidity.

A low temperature thermostat set at 70 F is installed in the discharge duct for regulating the entering air temperature in the heating season.

The nonfreeze preheat coil in the outside air intake is controlled by a modulating type thermostat set to maintain the leaving air temperature at 45 F.

A damper in the outside air intake is controlled by a relay to the fan. As the fan stops the damper closes, and as the fan starts the damper opens.

The controls are all of the pneumatic type.

Eight Compressors for Dining Area

The dining room covers an area of over 20,000 sq ft, and has a specially designed acoustical, dome type ceiling 20½ ft high high with fluorescent lighting, a terrazzo floor, glazed tile wainscoting and stainless steel cornices.

Eight 20 hp compressors, housed in a special machine room away from the dining area, provide refrigeration for air conditioning. All the duct work, piping and wiring are concealed, with only the air outlet grilles showing along the edge of the dining room ceiling. The equipment delivers 42,000 cfm of air. Only the number of compressors required are operated, and the system is thus quite flexible.

Piping Fuel, Conditioned Air, Other Services at an Airport

William J. Whatley, Mechanical Engineer, Wyatt C. Hedrick, Architects and Engineers, describes the design of a modernized municipal airport, the new work including a terminal building, runway improvements, and underground piping tunnels to pits for furnishing parked planes with fuel, conditioned air and other services. Without doubt, the safest and lowest cost method of moving fuel around an airport is by pipe lines, says the author

THE CITY OF HOUSTON is modernizing its municipal airport by the addition of a new terminal building and extensive runway, distribution, electrical and paving improvements. The new building will face south, with ramped approaches and adequate parking space on the north side. South of the building, two "fingers" will extend onto the runway, at an angle, providing adequate parking space for landed planes and the various service pits.

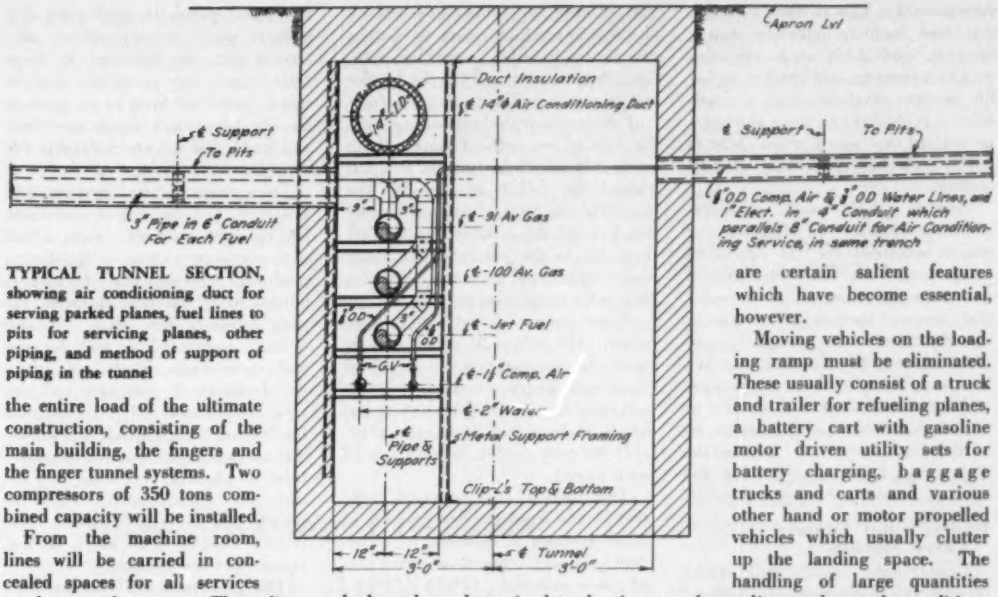
The terminal building will consist of two floors and an observation deck on the roof. The first floor is to be used for handling and storing baggage, mail and express, most of which will be conveyed by mechanical means for speed and efficiency. The second floor will comprise waiting rooms, airline offices, customs offices and ticket offices.

MOTORIZED FUEL SERVICER for planes, showing hoist (for raising operator and hose lines to the plane tanks) in the "up" position. Suction hose from this servicer takes gasoline from hydrants in fuel pits

General Machinery Room

On the first floor, a large area depressed 3 ft below normal floor level will form a general machinery room which will contain the boiler plant, water treating equipment, hot water generators, the main electric switchboard panels, and centrifugal compressors and pumps for the air conditioning systems. These systems — located at various points to serve certain specified areas, such as cafeteria, offices, waiting rooms, etc. — will operate on a year 'round basis. Each will consist of a fan, coils, filters, housing and complete duct distribution and return.

Chilled water will be pumped to the various coils from pumps in the general machine room, and steam will be supplied from the boilers in the same location. Coils will be returned by traps, and all piping serving the various systems in the terminal building will be carried in trusswork and furred spaces provided for its concealment. Chilled water will be supplied at 48 F and steam will be at 15 psig. The capacities of the refrigeration compressors, pumps and boilers will be sufficient to carry



TYPICAL TUNNEL SECTION, showing air conditioning duct for serving parked planes, fuel lines to pits for servicing planes, other piping, and method of support of piping in the tunnel

the entire load of the ultimate construction, consisting of the main building, the fingers and the finger tunnel systems. Two compressors of 350 tons combined capacity will be installed.

From the machine room, lines will be carried in concealed spaces for all services to the tunnel system. These lines will drop into small service pits under the south end of the building, extend from these pits through underground conduit to the tunnel systems. These pipe lines will include chilled water and return, steam and return, and service water, and will be carried in a recently patented type of underground conduit.

There will be two boilers, of the fire tube type, gas fired, with induced draft and fully equipped with automatic combustion controls.

On the finger side of the building, passengers will land at the second floor level onto electrically operated bridges, moving along each side of the fingers, to the landed plane; this will permit all passengers to enter the building without being exposed to the weather at any time. The first floor level of this construction will contain stairways for the upper level and for access to the underground tunnel, automatic baggage conveyors, and many other modern facilities. The third finger level will be a roof deck observation platform.

Directly below the fingers, a reinforced concrete tunnel will be constructed below ground level for the various services to be provided. This tunnel system will extend to the east and west sides of the building, where bulk storage plants will be located. The size and extent of bulk storage had not been determined to the time of design, but the general system layout will accommodate almost any reasonable number of bulk plants.

Selecting Services for an Airport

Many factors are involved in the selection of services for a municipal airport, and a great deal of research is required before a particular undertaking can emerge as a practical and workable plan. The number and types of planes, landings and departures, time available for servicing, and many other details must be determined and evaluated. Due to varied sizes of commercial aircraft, the fuel, heating, cooling, and electrical requirements, and space for servicing are different and variable and the whole design must represent a co-ordinated and composite system.

There is probably no set rule or regulation which will govern the modern municipal airport. Local conditions and data can be pretty well established, but one set of conditions may not fit the needs of another locality.

No one can definitely determine just what the future will bring in the commercial aviation industry, and a workable design for an airport may therefore be compared to the planes which it is designed to service — it may become obsolete before the test flights have been completed. There are certain salient features which have become essential, however.

Moving vehicles on the loading ramp must be eliminated. These usually consist of a truck and trailer for refueling planes, a battery cart with gasoline motor driven utility sets for battery charging, baggage trucks and carts and various other hand or motor propelled vehicles which usually clutter up the landing space. The handling of large quantities of gasoline under such conditions constitutes a definite hazard, and the mass of equipment causes delay in departure of the loading plane. A fire extinguishing truck or cart is also part of the necessary equipment.

Storing and Distributing Fuel

The problem of storing and distributing aviation fuel is a major one. Without doubt, the safest and the lowest cost method of moving fuel around an airport is by pipe line. This involves the selection of a system, with its branch distribution to several points on the parking apron, whereby all kinds of necessary fuel can be handled to the best advantage. In addition, shall all brands of fuel be handled in the same pipe lines, or shall each brand be handled as a separate product? The first scheme has been called "co-mingling". It is the lowest in first cost, and might be attractive enough to be adopted, as it has at several installations now in service. It has been said this system might promote a tendency for all fuel suppliers to deliver the cheapest product and one barely meeting the specifications.

The second has been called the "brand integrity" method. It has been said to be one of the foundation stones upon which competition rests. Petroleum companies have spent large sums for research and product

development. This is done in order that lead fouling, induction system deposits, and other such obstacles may be overcome, and greater engine life between overhauls made a possibility. It has become more and more recognized that specification alone is not a sufficient guarantee of fuel quality.

This is where local conditions enter the picture. In Houston, our major industries are the petroleum companies, with large investments and extensive construction, in order that between their mutual research, the objectives of higher quality and efficiency may be made realities. We live with the petroleum companies, and we should work with them.

The question remains, however, as to the best system for use, so the design has been completed on the basis of either system being possible.

Underground Tunnels Carry Services

Underground tunnels will extend on each side of the terminal building, and end at a point near the bulk storage areas. In front of the building, a tunnel will connect to each of the side branches, and under each finger a similar tunnel will extend for the full finger length. At the start of each finger, the tunnel widens to provide machine rooms to contain the air conditioning system fan, coils and filter sections, and the condensate return pump and air compressors.

Fuel mains from bulk storage will be carried on metal framing along each sidewall of the tunnels, and will extend the full 6 in. size for the length of the fingers, acting as supply headers for the 3 in. service take-off branches to the pits. Service water and compressed air lines will also run in the same manner.

Three grades of fuel will be supplied: 100 octane, 91 octane and jet fuel. Sixteen fuel pits will be served from each finger, providing possible servicing for four different manufacturers of fuels, with four pits available for each vendor, on each side of each finger.

This airport is a terminal type; that is, one requiring the servicing of large volumes of gasoline to scheduled airliners. Speed of service is of course essential.

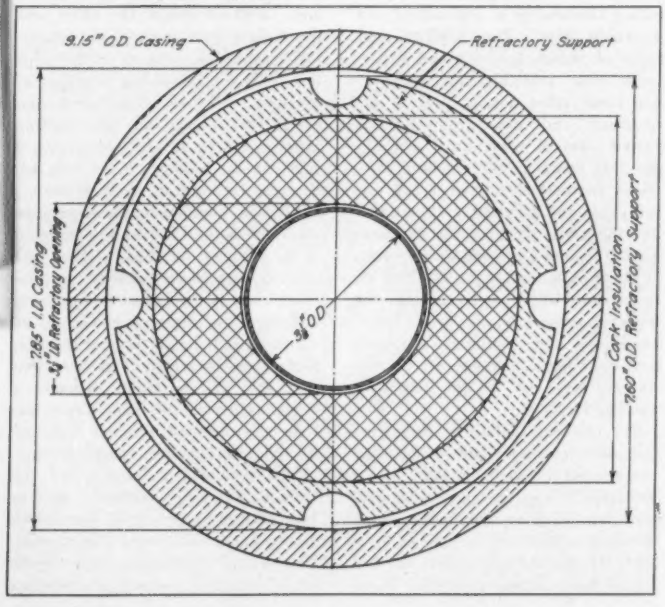
Methods of Servicing Planes

Several methods of servicing planes on the apron have had acceptance. These include service trucks; service pits with hose reels, filters and pumps in small pits; and hydrant pits. From hydrant pits, service may be delivered by hose carts, which may be either hand or motor propelled. Each of the systems has its advantages (both operation and cost) and all are adaptable for some local conditions.

The hydrant system was selected in this case, and the use of motorized fueling carts assumed. Such a fuel cart contains a built-in hoist and platform, whereby the operator is hoisted with his hose lines to the wing tanks of the plane. It also contains complete hose reels for several connections, filters and pump-out facilities — whereby fuel not used can be returned to the particular hydrant from which it was drawn. The cart does not contain large quantities of gasoline, and thus does not constitute a fire hazard. While the presence of any vehicle on the ramp is objectionable, the cart is of low, streamlined construction.

The fuel pits will contain three lines each, and each line will terminate in a self-sealing valve. Each line with its valved delivery point will have a capacity of 150 gpm, at 30 psig, at the pit. Each line will consist of 3 in. Schedule 40 black steel pipe, supported by refractory supports and housed inside non-metallic conduit. The interior pipe will be coated with corrosionproof paint, to combat the corrosive high humidity atmosphere. The 3 in. pit connector lines will be welded into the tunnel mains. All conduit to pits on the entire system will serve as pit drains, as well as protecting the inside pipe.

METHOD OF RUNNING chilled water and return lines in non-metallic conduit. This construction is to be prefabricated in 13½ ft lengths and joined with special couplings



Sheet Metal Header for Air Conditioning

For air conditioning parked planes, a 14 in. ID sheet metal insulated header will extend from the machine room to the ends of the fingers. Run-outs to the air conditioning pits will be 8 in. non-metallic pipe, with sheet metal connectors from the 14 in. header in the tunnel proper. All sheet metal ductwork will be insulated.

The machine room will contain the built-up type of equipment, with filters, heating and cooling coils, and centrifugal fan of 2500 cfm capacity at 4½ in. static pressure, with non-sparking wheel. Outlet velocity will be 2400 fpm at 1785 rpm. Fans will have vibration absorbing bases, V

belt drives and 5 hp explosionproof motors. Air filters will be 20 x 30 in. in size, 2 in. thick washable type.

Each section of the tunnel will have its own ventilation system, and will drain to duplex sump pumps at the extremity of each finger section. Exhaust fans will be vane-axial, V belt driven, with nonsparking fan wheel complete with inlet cone and discharge cone. Capacity will be 10,200 cfm at 1½ in. SP, with outlet velocity of 1800 fpm and fan speed of 1750 rpm. These fans will be driven by 5 hp explosionproof motors.

In addition to the various services already mentioned, floodlighting of the aprons and landing strips will be provided. Rectifiers in some pits will be direct power supply units for providing either 14 or 28 volt d-c service to airplanes while parked at wheel positions on the ramp.

The air conditioning pits will each contain 8 in. valves for the air conditioning outlets and 50 ft of 8 in. flexible hose for connection to the planes. In addition, these pits will contain automatic hose reels for compressed air and water service.

All pits will be constructed of reinforced concrete, with fabricated steel covers. Fuel pits will have brass, non-sparking angle liners and other pits will have steel lining angles. All conduit runouts from the tunnel to the pits will be installed on slight grade, permitting the conduit both to ventilate and drain the service pits through the perforated pit covers.

Snow Melting Problems — And Answers

AT WHAT TEMPERATURE should circulating water used in a snow melting system be maintained?

This is one of the questions most frequently posed by engineers and contractors concerning the growingly popular subject of snow melting, according to A. M. Byers Co.

The answer to this question, as it appears in a technical data letter issued by the company, is that when the pipe is located in a 6 in. concrete slab, a water temperature of approximately 140 F is usually satisfactory. Where the pipe is not embedded in the concrete slab, but is placed in the fill underneath, a higher temperature is needed — approximately 160 to 170 F.

Other frequently asked questions, and their answers, are:

May the pipe be embedded in a bituminous mix, instead of concrete?

Yes. The assumption that hot pipes might soften the mix is not warranted, since the slab will undoubtedly undergo even higher temperatures when exposed to the summer sun. It should be noted, however, that a bituminous material does not have as high a heat transmission factor as concrete, so that complete snow clearance calls for spacing of pipes no more than 12 in. apart.

When the pipe is embedded, what is the necessary slab thickness?

With a bituminous slab, it is recommended that at least 2 in. of surfacing be over the pipe. Where heavy loads are anticipated, 3 in. or more is recommended. Concrete slabs should have at least 2½ in. over the top of the pipe. This will minimize the formation of hairline cracks. It will also result in a more even heat transfer to the surface. It is suggested that a minimum of 1 in. of material be allowed below the pipes, whether the material is concrete or a bituminous mix.

Is an antifreeze solution necessary?

Some means should be employed to keep the heating medium from freezing when the system is not in operation. A 40 percent solution of a permanent type (ethylene glycol base) antifreeze and water is suggested to prevent freezing. There is an increasing use of light oils to replace the water-ethylene glycol solutions, but not too much is known about their performance over a long period of time.

How much fill is necessary below the slab, and what type is recommended?

This varies, but under normal conditions 4 to 6 in. of fill should be sufficient. Where ground conditions do not permit good drainage, or where there is a high water table, a deeper fill should be used. Fill should be of crushed stone, washed gravel, or similar materials. *Cinders and other sulphur bearing or acid producing fills should be avoided.*

For what melting rate are most snow melting systems designed?

Under almost all conditions, a melting capacity of 1 in. per hr of snow is adequate.

HEATING MODERNIZED AT OLD CHURCH

NORMAL PROBLEMS encountered in providing adequate and economical heating in a church structure are magnified when a building dates back to 1739. Such was the case at St. Paul's Episcopal church, Norfolk, Va., according to the National Radiator Co.

A. R. Thompson, the heating contractor, replaced the old boiler in the basement of the parish house with a steel boiler having an SBI steam rating of 7290 sq ft. The vapor heating system, zoned for the church structure and the parish house, was kept but hand operated valves were replaced with motorized valves operated from thermostats.

Heat is needed rather constantly during winter months in the rector's office and in the secretarial rooms in the parish house. Therefore, a heat exchanger on the new boiler provides hot water for heating these offices. It is possible to operate the oil burner for periods of time brief enough to raise the water temperature yet not long enough to produce steam.

The church school has grown considerably in recent years, so the parish house basement was remodeled. Fin radiators along the walls receive hot water from the boiler. A steam line was run from the boiler to the third floor to serve a unit heater installation in this formerly unused space which is now a Scout room.

High enclosed pews pose a heating problem due to pocketing air flow. This was overcome by installing wall fin radiators behind some of the pews.

This renovation of the heating plant, utilizing a five-zone combination of hot water and steam, has reduced operating costs, simplified operation, and provided a high degree of flexibility in heating the component parts of this historic church and its busy parish house.

Heating the Schools of Los Angeles

By Stuart Giles
Associate Mechanical Engineer
Los Angeles City School District

With nearly 500 separate building sites totaling 3100 acres and with 20,000,000 sq ft of buildings, the heating and ventilating problems met in Los Angeles schools are numerous and varied. Mr. Giles describes the types of installations used, and gives practical design, maintenance and operating suggestions

THE LOS ANGELES CITY school board operates the largest school district in the United States. Covering not only the city of Los Angeles but much of the Los Angeles county area as well, it draws students and taxpayers from approximately 828 square miles. With nearly 500 separate building sites totaling 3100 acres, we find ourselves with 20,000,000 sq ft of buildings to clean, repair, paint, light, ventilate, heat — and worry about.

The heating and ventilating problems are numerous and varied. The 11,300 classrooms include — as well as the desk and blackboard variety — demonstration rooms, lecture rooms, laboratories for chemistry, physics, biology, domestic science, petroleum engineering, plant technology, cosmetology, milk technology, pathology, ophthalmic optics, etc. There are also woodworking, automotive, sheet metal, ceramics, machine tool, plumbing, electric, and other shops. In addition, the school district operates over 1000 other rooms used as offices, warehouses and maintenance shops and for other non-teaching facilities.

All these spaces require some sort of heating and many require ventilation. Although the school district has no air conditioning systems, it has probably every known means of heating in practical use today and some that have been considered obsolete for many years. Much equipment carries manufacturers' names who have long since gone out of business. In fact, a large school district of this type is an excellent place for an engineer to pick up a background in heating and ventilating by actually seeing in operation an array of methods and equipment which represent the development of heating and ventilating techniques over the past 50 or more years.

All rights reserved by the author.

Winding Up $100 Million Program

Probably of most interest to engineers are experience and current practice in new building work by the Los Angeles city school district.

In 1946, the Los Angeles city school board was voted a $75 million bond issue by its taxpayers. With this and current funds we are now winding up a $100 million expansion program. Included in this program are new plants for elementary, junior high and high schools, new junior colleges, and additions to existing schools and rehabilitation and modernization of obsolete buildings.

An independent consulting architect is commissioned to design most new building projects. He in turn employs the services of the various consulting engineers. Other work is designed by the building branch of the school board, which also directs the work of the commissioned architects and the consulting engineers, handles all contracting and much of the inspection during construction. This office must check the commissioned architects, work for budget limitations, see that certain standards are maintained and that workable and durable plants are produced. The architects and engineers are given much freedom of design, to which the extreme variation in style and site arrangement of Los Angeles schools will attest.

With the modern functional trend so strong in Southern California architecture, the mechanical engineer is more and more hard-pressed to find room for his equipment. Large windows, narrow mullions, flat roofs without attics, concrete slabs on fill floors and one story construction make the heating and ventilating designer tear his hair and wish for the "good old days." The additional necessary detailed drawings and studies are reflected in higher design costs. The "work it out on the job" type of design is not acceptable.

Because packaged forced air furnaces fired by natural gas have a low initial cost and provide extreme control flexibility, we have had very good results with them in the bungalow schools. Such installations operate on the "domestic" gas rate.

Large plants are equipped with oil fired boilers in most cases, as it is generally inconvenient to operate industrial gas-oil burners in our schools. Although not used in the majority of central heating systems, forced hot water seems to become more popular all the time, as such installations give the designer a piping system which can be easily fitted into modern, flat roofed structures. Approximately half of our new boiler installations in the last five years have been forced hot water.

Must Design Against "Human Destruction"

The human element in a school plant is as important — if not more important — as in any other type of building. There are three types of "human destruction" to be "designed against"; they are inadequate maintenance, improper operation, and vandalism.

Inadequate maintenance and im-

proper operation are problems because most of our school heating and ventilating equipment is run by janitors who may have their attention on the dusty table tops while the exhaust fan squeals to a halt for lack of oil and the low water switch is frozen because it has not been blown down in months.

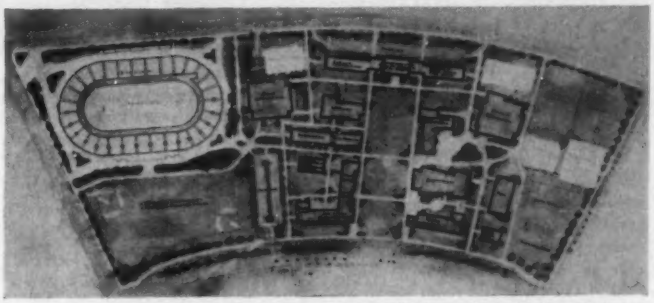
If equipment that is convenient and easy to maintain is provided, and the maintenance supervisor has a large whip, you are headed in the right direction. School boards seem to agree that maintenance personnel in general — and mechanical maintenance men in particular — are luxuries that can easily be cut to a minimum when the taxpayers' committees come storming in at budget time.

Public buildings in the United States pay a staggering bill each year for vandalism and depredation. This cost has averaged $118,000 annually for the past five years in the Los Angeles city school district. The mechanical designer and specification writer should have the word VANDALISM before him at all times when working on any school job. Only equipment which is truly vandalproof, when available, should be used. Slot head screws and snap-on covers are invitations to the mechanically minded schoolboy. Thermostats disappear by the dozen when installed without guards. Return air grilles, exposed piping and other equipment must be installed to withstand the butting, kicking and climbing of 250 lb football players. Unlocked scuttles and hatches and flimsy louvers are invitations to illegal entry.

The classroom is, of course, a sedentary area and must be heated as such. Thermostatic control is very desirable — as rooms in use without it will testify. Ventilation is very desirable in colder climates and a good investment in mild climates. Southern Californians have a phobia against closed windows but it is our experience that even with windows open, redecoration savings and better heat distribution give forced air circulation a distinct edge from the owner's — as well as the occupants' — points of view. Budget limitations are the dictating factors in most designs and the type of equipment can only be determined for each project as contract estimates are developed.

THIS BUNGALOW TYPE SCHOOL (Gault St. elementary) has a natural gas fired heater for each room

LARGE SCHOOLS — such as the Los Angeles Harbor junior college — have oil fired boilers in most cases. This installation is forced hot water



100 PSI STEAM IS SUPPLIED through tunnels from oil-gas boilers, and is reduced to 5 psi at each building, for heating the East Los Angeles junior college

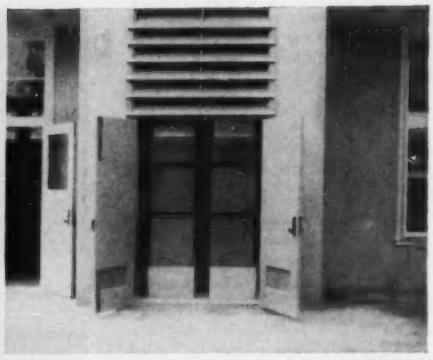
With the trend to large glass areas on both sides of the room in the "campus type" schools, it is becoming more difficult to heat satisfactorily the 850 sq ft in the average classroom. Many schoolrooms are designed with cabinet work or low window sills, which further complicate the problem of space for heating equipment.

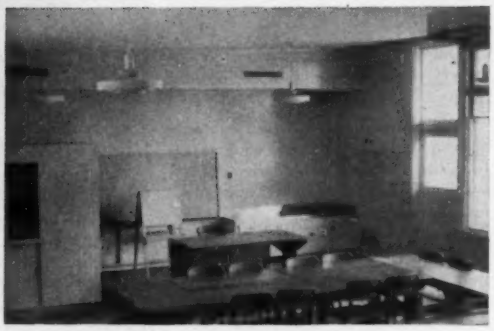
Various Heating Methods Used

The Colfax Ave. school is an example of a successful method of heating the "campus type" of school plant with gas fired, forced air units. The Los Angeles school district has built many successful elementary schools of this type. Flexibility with outside air and recirculation, reasonably good air distribution and low first cost are advantages of this type of system. The large number of furnaces and the spread out arrangement are disadvantages which the maintenance people won't let us forget.

Unit heaters in classrooms have low first cost but present a number of problems. Noise levels are usually distractingly high and the ordinary on-off fan operation accentuates this condition. Good heat distribution is usually difficult to accomplish.

The accompanying test curves





CAMPUS TYPE SCHOOL (Colfax Ave.) — top left — is successfully heated with gas fired, forced air units . . . . HEATER ROOM — lower left — built out to eave line is shown in this view of a typical classroom building at the Colfax Ave. school . . . . TYPICAL CLASSROOM HEATER ROOM — top right — at Colfax Ave. school, showing two forced air, gas fired furnaces each serving a classroom . . . . CLASSROOM INTERIOR — lower right — at Colfax Ave. school, showing two supply grilles at ceiling and return grille near floor

for the Baldwin Hills school, made in a two year old installation, show results with such a job, and how the addition of ductwork and ceiling diffusers in the same room can produce excellent results.

Although radiant panel heating has proved itself effective in many climates, it has (in our experience) some disadvantages for schools in a mild climate. The outside air temperature in this area will fluctuate rapidly, many times as much as 30 F in a few hours. The sun load, lighting load and heat storage of the concrete slab will be enough to produce serious over-ride in room temperature which is a source of complaint from the occupants.

This disadvantage may of course be outweighed by the numerous advantages of panel heating which have been so widely publicized. We feel that where ground temperatures are mild, a little insulation around the slab and an insulating type of floor covering will produce satisfactory surface temperatures for our installations.

An excellent schoolroom heating system might be a split system of panel heating and forced air heating and ventilating, but the building budget will not often allow such an installation. We have two such systems under construction but have no real experience as yet.

The straight forced air system with good air distribution design, good anticipating thermostats, automatic recirculation and outdoor air dampers and individual room control will give good results. The air can be heated with direct gas or oil fired heat exchangers, steam or hot water coils.

Air filters are always a good investment, even in a country school away from industrial contamination.

Design Details To Consider

Some design features which we often find overlooked are worth noting. We avoid the use of manual balancing dampers in duct branches of forced air heating systems; they cause quite a bit of difficulty in future years because, invariably, someone will reset them and get the system out of balance. The duct design should be carefully made to be self-balancing. The inevitable alterations in future years can provide dampers where and if necessary. Where dampers cannot be avoided, we make sure they are in accessible locations with quadrant indicators and locking nuts on the outsides of the ducts. Where small branch ducts must be dampered, volume control units behind grilles have been found to be practical.

Fire dampers are a source of trouble on many installations. They should be carefully located, with accessibility in mind. Many a faulty system has been traced to a closed fire damper causing expensive repairs because it was inaccessible and it was found necessary to break into

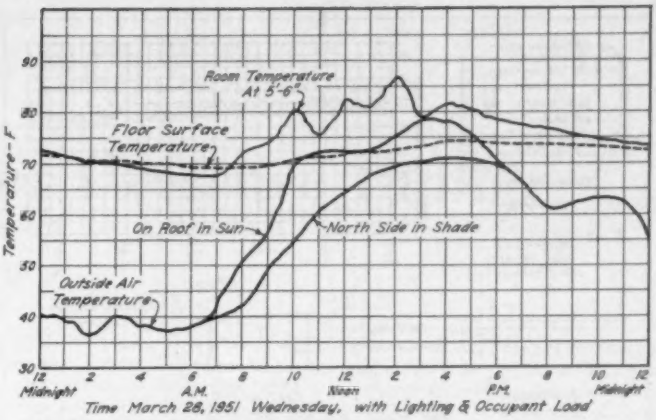
a wall or ceiling. Check for low temperature fusible links. Fusion temperatures should be as high as local codes will permit on direct fired heat exchanger jobs (250 F if possible.)

A forced air heating system is no better than the distribution of air in the heated space. The outlets must be located carefully, and a sufficient number of outlets with the correct amount of diffusion and velocity for the elevation and throw must be provided. Unfortunately, accurate data on this point is not always available.

Return air grilles present two problems. With a face velocity of over 400 fpm, the children will soon find that such a grille will hold papers or exhaust small scraps. Sometimes it seems that no matter where the low return grille is located, a teacher will stack something against it and block it off. Your guess is as good as is anyone's on this problem. Low supply grilles therefore seem impractical in schools.

The central heating and ventilating centrifugal fan in a school deserves careful consideration. We find that a well constructed and carefully balanced fan with an outlet velocity below 1600 fpm, mounted on an "engineered" vibration base, gives years of service. We believe that the sheaves and electric motor must be balanced and that the V-belts must be a matched set. We also find it pays to specify an adjustable sheave on the motor to allow for the tuning-up a system often needs in future years. Modern construction is often susceptible to resonant frequencies which a change of a few rpm can eliminate. A good belt guard (with tachometer holes), extended oil cups and a convenient disconnect switch will make the installation a finished job.

Duct insulation has been another source of trouble in our schools. Some types without protecting covering soon get torn and broken. Accessible attics and basements may not be used often, but in 10 years or so unprotected insulation seems to get pretty well torn off. Exposed insulated ducts and piping must of course be carefully protected. Where traffic can contact the insulation, a sheet metal jacket will pay for itself in a short time. In shower rooms and other humid areas, 8 oz canvas sewn on and painted with lead and oil paint or metal jacketing stands up very well. Sometimes, the internal acoustic lining will provide sufficient thermal insulation.



THERMOSTATIC CONTROL is very desirable, as rooms without it will testify. These temperature-time curves were plotted by the author for a primary room in a school which has manually controlled steam radiation

Insulation should be protected from water. Many times our piping insulation has been destroyed by a leaking valve stem or expansion joint packing. Ventilation in furred spaces and under floors and tunnels should be checked. Mildew can soon destroy insulation and pipe. We have had standard black steel pipe with cast iron fittings rust out in five short years because of inadequate tunnel ventilation.

Controls Should Be Simple and Sturdy

Controls for school heating and ventilating systems should be simple, heavy duty and readily accessible for repairs but locked up so that students cannot get to them. School systems are always short of funds for replacements of expensive equipment and many a "perfect" control system is bypassed when it gives trouble and money is not available for a new damper motor or other vital part. Schools are generally built on bond issues but maintained on current taxes, and there is where the pinch comes.

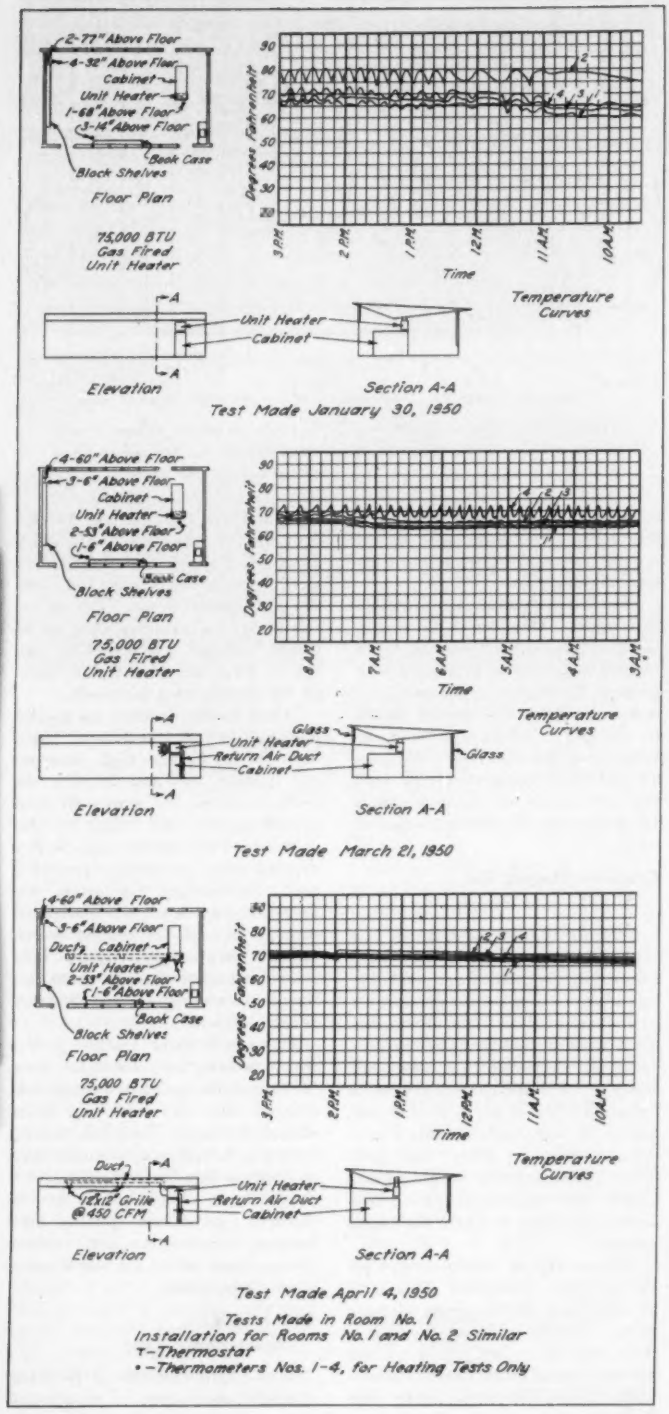
Heating system control brings up the question of safety. This is a problem that justifies plenty of automatic controls. All our heating is done with either fuel gas or oil and we have found it advisable to standardize on the 100 percent safety pilot for small gas furnaces and heaters and the Underwriters' Laboratory group IV controls with intermittent pilot, flame failure detector and flame rod for boiler firing. The safety valves and low water switches are of course included. It seems to take two or three safety devices to make an installation truly foolproof.

School heating systems are usually operated on an intermittent basis. Most rooms have a high occupant and lighting load and therefore the heating systems are principally used to pick up the load before the students arrive and idle through the day or shut down completely around 9 a.m. In Southern California, this operation routine is particularly evident all through the heating season (which surprisingly enough lasts from September through June, although the average space heating day is only 3 hr long.)

This short daily heating period means nothing but trouble for those lift fittings, the undersized condensate receiver, the coil with not quite enough drainage. The whole heating system is brought up to temperature as fast as possible and shut down practically as soon as things start to stabilize. Expansion joints, pipe hangers, condensate and vacuum pumps never get to the stable operating temperatures.

Build In Low Maintenance Cost

With a probable life of 40 years, a school plant must be simple and



ADDITION OF CEILING DIFFUSERS and ductwork to the gas fired unit heater installation at the Baldwin Hills school produced excellent results, as indicated by these test curves

easily maintained. This is not a condemnation of modern equipment but a request to keep it simple. Too many heating and ventilating engineers seem to want to regulate and pipe a school heating system as if it were the most delicate manufacturing process. One superintendent of schools is quoted as saying he considered the thermostat the most important thing in the room next to the teacher. This is very true, but it is also true that young people in school are not as sensitive to small temperature changes as is an elderly invalid in a wheelchair. We have rarely had a complaint from a student but have had many from the teaching staff. (The number and vehemency of complaints often seem directly proportional to the age of the complainer.)

School board members, administrative personnel, principals, directors and anyone else in the "owner's" position should see that low maintenance cost and economy, as measured by long term amortization, are built into the school. This is not necessarily measured by first cost. Maintenance and early replacement of equipment will often eat up first cost savings in a very short time.

Because a school building is usually a 40 year investment, the designer must carefully pick and choose his materials and equipment to have it stand up under rugged service conditions. "Gadgets" in a school plant will often turn into a poor investment.

To be successful, a school building must gain public acceptance. Progressive design, but not radical; pleasant appearance, but not gaudy; safety and convenience — all must be designed into the plant. City planners and school boards are thinking more and more of the school plant as a community center for use also on evenings and weekends.

All these factors are important to the designing engineer because his equipment must fit into the broad plan. The heating and ventilating equipment must be engineered into the job to give long life, dependability, little maintenance, to be simple in operation and to fit the architectural concept.

Code for Pressure Piping

FROM TIME TO time, reports of certain actions of the Sectional Committee B31 on the ASA Code for Pressure Piping, sponsored by The American Society of Mechanical Engineers, are issued for the information of interested parties. While these do not constitute formal revision of the Code, they may be utilized in specifications, or otherwise, as representing the considered opinion of the Committee.

Pending revision of the Code for Pressure Piping, ASA B31.1-1951, the Sectional Committee has recommended that selected interpretations be published so that industry may take immediate advantage of corresponding proposed revisions.

Cases 6, 7, 8 and 9 are given here and are reprinted from the October issue of *Mechanical Engineering* by special permission of the publisher, The American Society of Mechanical Engineers, 29 W. 39th St., New York 18, N.Y. Case 5 appeared on page 61 of the August HPAC, and Cases 1 to 4, issued prior to the latest revision of the Code, have been annulled.

Case No. 6

Inquiry—In view of the publication of the American Petroleum Institute Standard API-600, February 1951, containing Tables 18 and 19 having increased pressure-temperature ratings for 4-6 percent chrome steel to ASTM A217-C5 and ASTM A182-F5 over those now shown in Tables 19 and 20 of Section 3, Oil Piping, of the Code for Pressure Piping, may these increased ratings be used for valves, flanges and fittings made of these materials in oil piping applications?

Reply—It is the opinion of the Committee that pending a general revision of the Code, the pressure temperature ratings shown in Tables 17 and 18 (pages 48 and 49, respectively) for the temperature range of 100 to 750 F may be substituted for the values shown in Tables 19 and 20 (pages 50 and 51, respectively) for the same temperature ratings.

[Note: The ratings in Tables 17 and 18 are the same as those shown in API 600 in Tables 18 and 19 for 100 to 750 F.]

The Sectional Committee on the Code for Pressure Piping decided to coordinate its work in the field of establishing maximum allowable stresses for materials with that of the ASME Boiler Code Committee, and through proper liaison, representative members of the Code for Pressure Piping have been serving also as members of the Boiler Code Subcommittee on Stress Allowances for Ferrous Materials in order that the fundamental work on the properties of the materials might be carried on most expeditiously and without duplication of effort.

This committee has leaned very heavily on the data contained in the Miller-Hager report (ASTM Publication No. 100), but has supplemented this report by additional data submitted by other research groups. After long and careful deliberations, the committee selected values for ultimate strength, yield strength, creep rate, and stress rupture, which in their combined judgment represented values for these properties that could be used by code writing authorities in establishing safe working stresses. With this work done, it then became the responsibility of the individual code committees to select the factors that should be applied to these physical properties for determining the maximum allowable working stress for the code or code section in question.

Section 1 of the Code for Pressure Piping deals with power piping, and for this section the following statement has been adopted: "The maximum allowable working stresses shall be established as the lowest of the following stresses:

A. One-fourth of the minimum specified tensile strength.

B. One-fourth of the tensile strength at temperatures as reported by test data.

C. Sixty-two and one-half percent of the yield strength at temperature as reported by test data.

D. A conservative average of the stress to give a creep rate of 0.01 percent in 1000 hr as reported by test data."

A table of stresses computed on the basis given above appeared on page 676 of the August 1951 *Mechanical Engineering*.

Sectional Committee B31 has taken action to publish the following case to make the most recently-developed stresses available to manufacturers of pressure piping.

Case No. 7

Inquiry—In view of the fact that the ASME Boiler Code Committee has adopted new stress values for Section 1 of the ASME Boiler Construction Code, some of which are higher than those now permitted in Tables 3 and 3a, are these increased

[*Concluded on page 118*]

Sam Lewis' Page

. . . . . pertinent comment on practical problems

• INFORMAL COMMENT on heating, piping and air conditioning matters is given in this regular feature by Samuel R. Lewis, consulting mechanical engineer and a member of HPAC's board of consulting and contributing editors. Designer of many very successful radiant heating installations, he reports some plastering troubles he's had on such jobs for the benefit of other engineers and contractors, and suggests possible ways of avoiding them in the future.

PLASTER AND RADIANT HEATING

ANY LAYMAN who has ever attempted to plaster a ceiling must admit that — while plastering is a highly paid craft — its practice requires a high order of skill as well as great physical strength and endurance.

Many buildings are plastered in cool, damp weather. The plasterers like to have gentle heat in the room that is being treated.

Radiant heating is fine for warming people after the room is enclosed and completed. Radiant heating for warming and drying wet plaster seems to me to leave a great deal to be desired.

In one case, the oil burner control failed so that the radiant pipes became very hot, dried the wet plaster too quickly, and cracks appeared.

In another case, while we specified that the plaster must be hardened and cured before the radiant tubes were heated, the contractor insisted on warm water flowing through the tubes while he applied the plaster. As a result, many cracks appeared.

In another case where the radiant heating tubes were wired below the metal lath — and where the plasterer had more influence than did the heating specifications, and did have the tubes hot — there is a crack in the plaster under every tube. In this case the plaster contractor was required to do the job over.

In another plant, the plaster contractor wired strips of metal lath, each about 6 in. wide, under the tubes that were below the first layer of metal lath. His idea was that even though he insisted on heated tubes, the cracks would not appear. Regardless of the extra metal lath in this scheme, the plaster was considerably thicker in the areas between the tubes than at the tubes. The dried-out ceiling looks like the billows of the sea and is unacceptable.

It appears that we must insist that the radiant heating pipes and tubes shall be *above* the metal lath, that the plaster shall be as nearly as possible of uniform thickness over the whole ceiling, and that the plaster shall be allowed to set and cure under normal temperature without any heat in the tubes.

Having designed eminently successful radiant heating systems for many very large hospitals and similar structures, we have learned that radiant heating and temporary heating during construction of new buildings are incompatible. Our experience suggests that temporary heating during construction should be accomplished by some other means than by the permanent hot water radiant surfaces built into the ceilings and floors.

Our experience also indicates that we should be on the job when the plasterers commence their work, since there is definite necessity for policing these skillful but temperamental artisans.

CODE FOR PRESSURE PIPING —

[*Concluded from page* 117]

stresses permissible under Section 1 *of the Code for Pressure Piping?*

Reply—It is the opinion of the Committee that pending revision of Tables 3 and 3a, the revised stresses given in Table P-5, Section 1 of the ASME Boiler Construction Code may be used for piping under Section 1 of the Code for Pressure Piping.

Case No. 8

Inquiry—Can alloy steel tubing with flared fittings be used in the area where seamless steel pipe with socket welding fittings is now specified?

Reply—It is the opinion of the Committee that alloy steel tubing of adequate wall thickness and flared or welding fittings, are permissible in this area, providing in the case of flared fittings, a satisfactory flare can be made.

Case No. 9

Inquiry—Under Section 1 *of the Code for Pressure Piping, what temperature should be used for designing instrument piping beyond the shutoff valve at the source connection?*

Reply—Tests indicate that the temperatures in the connecting lines beyond the shutoff valve at the source connection are always lower than the saturated steam temperature corresponding to the main line pressure. It is the opinion of the Committee that the design temperature for connecting lines beyond the source valve need not exceed the saturation temperature corresponding to the main line pressure. In no case, however, shall the design temperature exceed the limits for the material as prescribed in the Code.

Aluminum Pipe

DATA sheet

Reproduced through the courtesy of the Aluminum Company of America.

BURSTING PRESSURES of aluminum standard pipe (computed bursting pressures based on minimum properties at operating temperature not exceeding 100 F, in lb per sq in.)

Nominal pipe size, in.	Alloy and temper 3S-F	3S-H18	63S-T6	61S-T6
⅛	....	9,950	11,790	13,470
¼	....	9,620	11,400	14,970
⅜	....	7,800	9,250	12,140
½	....	7,480	8,870	11,640
¾	....	6,100	7,230	9,490
1	3,380	....	6,750	8,020
1¼	2,780	....	5,550	6,600
1½	2,490	....	4,990	5,920
2	2,100	....	4,200	4,980
2½	2,300	....	4,590	•5,450
3	1,990	....	3,980	4,730
3½	1,810	....	3,650	4,310
4	1,680	....	3,370	4,000
5	1,470	....	2,950	3,500
6	1,340	....	2,680	3,180
8	(.277) 1,010	....	2,020	2,390
8	(.322) 1,180	....	2,350	2,790
10	(.279) 810	....	1,620	1,920
10	(.307) 890	....	1,780	2,120
10	(.365) 1,070	....	2,130	2,530
12	(.330) 810	....	1,610	1,920

These computed internal bursting pressures are based on the nominal dimensions of the pipe itself, with no allowance for the effects of fittings or end connections, using Lame's thick wall formula as follows:

$$P = 0.95S\,[(d_2^2 - d_1^2)/(d_2^2 + d_1^2)]$$

where S = specified minimum longitudinal tensile strength in lb per sq in., viz.:

16,000 psi for 3S-F extruded pipe
27,000 psi for 3S-H18 drawn pipe
32,000 psi for 63S-T6 extruded pipe
42,000 psi for 61S-T6 drawn pipe
38,000 psi for 61S-T6 extruded pipe

d_1 = outside diameter, in.
d_2 = inside diameter, in.

The factor 0.95 is used to take care of items such as the difference between longitudinal and circumferential tensile strengths.

When using the above computed internal bursting pressures for design, a suitable factor of safety should be applied. A factor of safety of 4 is often used.

• Ratio of wall thickness to diameter changes sharply at this point.

CONVERSION FACTORS by which room temperature bursting pressures must be multiplied to obtain bursting pressures at elevated temperatures

Temperature, F	Alloy and temper 3S-F	3S-H18	61S-T6
150	0.92	0.95	0.96
200	0.85	0.90	0.92
250	0.78	0.85	0.84
300	0.71	0.78	0.71
350	0.63	0.68	0.57
400	0.55	0.56	0.41
450	0.47	0.45	0.25
500	0.39	0.34	0.15
550	0.32	0.23	0.11
600	0.25	0.14	0.08
650	0.20	0.11	0.07
700	0.17	0.10	0.06

PROPERTIES OF aluminum pipe alloys (ASTM Specification B241-49 T)

	3S-F	3S-H18	63S-T6	61S-T6
Typical mechanical properties				
Tensile strength, psi	•35-F 17,000	29,000	35,000	45,000
Yield strength, psi	8,000	26,000	31,000	40,000
Elongation (% in 2 in.)	40	9	12	17
Shear strength, psi	.....	16,000	22,000	30,000
Fatigue, endurance limit, psi	.....	10,000	.....	13,500
Modulus of elasticity, psi, 10,000,000 for these alloys (average of tension and compression moduli).				
Mechanical properties specifications, minimum				
Tensile strength, psi	.....	27,000	32,000	38,000†
Yield strength, psi	.....	.....	25,000	35,000
Elongation (% in 2 in.)	.....	.....	8	10
Typical physical properties				
Thermal conductivity at 25C (CGS units)††	0.40-0.46	0.37	0.30	0.37
Electrical conductivity % IACS	42-45	40	55	40
Nominal chemical composition				
% alloying elements	..... 1.2 Mn	..... 1.2 Mn	0.4 Si 0.7 Mg	0.6 Si 1.0 Mg 0.25 Cu 0.25 Cr
Average coefficient thermal expansion per F§				
—76 to ± 68	11.9	11.9	...	12.0
±68 to ±212	12.9	12.9	13.0	13.1
±68 to ±392	13.4	13.4	13.5	13.5
±68 to ±572	13.9	13.9	14 0	14 1

•This temper is uncontrolled; therefore, mechanical properties may vary considerably from those shown.
†42,000 for sizes under 1 in.
††CGS units = calories per second per square centimeter per centimeter of thickness per degree Centigrade.
§To be multiplied by 10^{-6}

DIMENSIONS, WEIGHTS and other data for aluminum pipe

Nominal Pipe Size, Inch	Schedule Number**	Outside Diameter, Inch	Inside Diameter, Inch	Wall Thickness, Inch	Weight per Linear Foot Pounds Plain Ends††	Cross-Sectional Wall Area Square Inches	Inside Cross-Sectional Area Square Inches	Moment of Inertia Inches⁴	Section Modulus Inches³	Radius of Gyration Inches
⅛	40*	.405	.269	.068	.085	0.0720	0.0568	0.0011	0.0053	0.1216
	80†	.405	.215	.095	.109	0.0925	0.0363	0.0012	0.0060	0.1146
¼	40*	.540	.364	.088	.147	0.1250	0.1041	0.0033	0.0123	0.1628
	80†	.540	.302	.119	.185	0.1574	0.0716	0.0038	0.0139	0.1567
⅜	40*	.675	.493	.091	.196	0.1670	0.1909	0.0073	0.0216	0.2090
	80†	.675	.423	.126	.256	0.2173	0.1405	0.0086	0.0255	0.1992
½	40*	.840	.622	.109	.294	0.2503	0.3039	0.0171	0.0407	0.2613
	80†	.840	.546	.147	.376	0.3200	0.2341	0.0201	0.0478	0.2505
	160	.840	.466	.187	.451	0.3836	0.1706	0.0221	0.0527	0.2402
¾	40*	1.050	.824	.113	.391	0.3326	0.5333	0.0370	0.0705	0.3337
	80†	1.050	.742	.154	.510	0.4335	0.4324	0.0448	0.0853	0.3214
	160	1.050	.614	.218	.670	0.5698	0.2961	0.0527	0.1004	0.3041
1	40*	1.315	1.049	.133	.581	0.4939	0.8643	0.0873	0.1328	0.4205
	80†	1.315	.957	.179	.751	0.6388	0.7193	0.1056	0.1606	0.4066
	160	1.315	.815	.250	.984	0.8365	0.5217	0.1251	0.1903	0.3868
1¼	40*	1.660	1.380	.140	.786	0.6685	1.496	0.1947	0.2346	0.5397
	80†	1.660	1.278	.191	1.037	0.8815	1.283	0.2418	0.2913	0.5238
	160	1.660	1.160	.250	1.302	1.1074	1.057	0.2839	0.3420	0.5064
1½	40*	1.900	1.610	.145	.940	0.7995	2.036	0.3099	0.3262	0.6226
	80†	1.900	1.500	.200	1.256	1.0681	1.767	0.3912	0.4118	0.6052
	160	1.900	1.338	.281	1.681	1.4292	1.406	0.4824	0.5078	0.5810
2	40*	2.375	2.067	.154	1.264	1.0745	3.356	0.6657	0.5606	0.7871
	80†	2.375	1.939	.218	1.737	1.4773	2.953	0.8679	0.7309	0.7665
	160	2.375	1.689	.343	2.575	2.1896	2.241	1.162	0.9788	0.7286
2½	40*	2.875	2.469	.203	2.004	1.7041	4.788	1.530	1.064	0.9474
	80†	2.875	2.323	.276	2.650	2.2535	4.238	1.924	1.339	0.9241
	160	2.875	2.125	.375	3.464	2.9453	3.547	2.353	1.637	0.8938
3	40*	3.500	3.068	.216	2.621	2.2285	7.393	3.017	1.724	1.164
	80†	3.500	2.900	.300	3.547	3.0159	6.605	3.894	2.225	1.136
	160	3.500	2.626	.437	4.945	4.2050	5.416	5.032	2.875	1.094
3½	40*	4.000	3.548	.226	3.151	2.6795	9.887	4.788	2.394	1.337
	80†	4.000	3.364	.318	4.326	3.6784	8.888	6.281	3.140	1.307
4	40*	4.500	4.026	.237	3.733	3.1740	12.73	7.232	3.214	1.510
	80†	4.500	3.826	.337	5.183	4.4074	11.50	9.611	4.272	1.477
	120	4.500	3.626	.437	6.560	5.5780	10.33	11.64	5.175	1.445
	160	4.500	3.438	.531	7.786	6.6210	9.283	13.27	5.898	1.416
5	40*	5.563	5.047	.258	5.057	4.2999	20.01	15.16	5.451	1.878
	80†	5.563	4.813	.375	7.188	6.1120	18.19	20.67	7.432	1.839
	120	5.563	4.563	.500	9.353	7.9530	16.35	25.73	9.251	1.799
	160	5.563	4.313	.625	11.40	9.6959	14.61	30.03	10.80	1.760
6	40*	6.625	6.065	.280	6.564	5.5814	28.89	28.14	8.496	2.246
	80†	6.625	5.761	.432	9.884	8.4050	26.07	40.49	12.22	2.195
	120	6.625	5.501	.562	12.59	10.7047	23.77	49.61	14.98	2.153
	160	6.625	5.189	.718	15.67	13.3242	21.15	58.97	17.80	2.104
8	20	8.625	8.125	.250	7.736	6.5779	51.85	57.72	13.39	2.962
	30	8.625	8.071	.277	8.543	7.2646	51.16	63.36	14.69	2.953
	40	8.625	7.981	.322	9.878	8.3992	50.03	72.49	16.81	2.938
	60	8.625	7.813	.406	12.33	10.4832	47.94	88.74	20.58	2.909
	80	8.625	7.625	.500	15.01	12.7628	45.66	105.7	24.51	2.878
	100	8.625	7.439	.593	17.60	14.9634	43.46	121.3	28.13	2.848
	120	8.625	7.189	.718	20.97	17.8355	40.59	140.5	32.59	2.807
	140	8.625	7.001	.812	23.44	19.9308	38.50	153.7	35.65	2.777
	160	8.625	6.813	.906	25.84	21.9705	36.46	165.9	38.47	2.748
10	20	10.750	10.250	.250	9.698	8.2467	82.51	113.7	21.15	3.713
		10.750	10.192	.279	10.79	9.1779	81.59	125.8	23.41	3.704
	30	10.750	10.136	.307	11.84	10.0720	80.69	137.4	25.55	3.694
	40	10.750	10.020	.365	14.00	11.9082	78.85	160.7	29.90	3.674
	60	10.750	9.750	.500	18.93	16.1007	74.66	211.9	39.43	3.628
	80	10.750	9.564	.593	22.25	18.9222	71.84	244.8	45.55	3.597
	100	10.750	9.314	.718	26.61	22.6289	68.13	286.1	53.23	3.556
12	20	12.750	12.250	.250	11.55	9.8175	117.9	191.8	30.09	4.420
	30	12.750	12.090	.330	15.14	12.8762	114.8	248.4	38.96	4.393
		12.750	12.000	.375	17.14	14.5789	113.1	279.3	43.81	4.377
	40	12.750	11.938	.406	18.52	15.7448	111.9	300.1	47.08	4.367
		12.750	11.750	.500	22.63	19.2423	108.4	361.5	56.71	4.335
	60	12.750	11.626	.562	25.31	21.5190	106.2	400.5	62.82	4.314
	80	12.750	11.376	.687	30.62	26.0354	101.6	475.1	74.53	4.272

**Schedule Numbers conform to American Standard for Wrought Iron and Wrought Steel Pipe, ASA B36.10.

*Also designated as Standard Pipe.

†Also designated as Extra-Heavy or Extra-Strong Pipe.

††Weights calculated for 61S and 63S. For 3S multiply by 1.010.

All calculations based on nominal dimensions.

LOSS OF HEAD in feet per 100 feet for flow of water in aluminum standard pipe

FLOW		NOMINAL PIPE SIZE, INCH								
Gallons Per Minute	Cubic Feet Per Second	1/8	1/4	3/8	1/2	3/4	1	1-1/4	1-1/2	2
1/6	.0003	1.76	0.43	.....	.....	.....	.....	.....	.....	.....
1/4	.0006	6.00	1.42	.....	.....	.....	.....	.....	.....	.....
3/8	.0008	12.2	2.91	.....	.....	.....	.....	.....	.....	.....
1/2	.0011	20.4	4.84	1.13	.....	.....	.....	.....	.....	.....
1/6	.0014	30.3	7.18	1.69	.....	.....	.....	.....	.....	.....
3/4	.0017	41.9	9.91	2.34	.....	.....	.....	.....	.....	.....
7/8	.0019	55.1	13.0	3.06	.....	.....	.....	.....	.....	.....
1	.0022	69.5	16.5	3.88	1.28	.34	.11	.....	.....	.....
1 1/4	.0028	104	24.4	5.74	1.89	.50	.16	.....	.....	.....
1 1/2	.0033	142	33.6	7.94	2.62	.69	.22	.....	.....	.....
1 3/4	.0039	187	44.1	10.5	3.45	.90	.28	.....	.....	.....
2	.0045	238	56.1	13.3	4.36	1.14	.36	.10	.....	.....
2 1/4	.0056	351	83.3	19.6	6.47	1.70	.53	.15	.....	.....
3	.0067	487	115	27.1	8.94	2.34	.74	.20	.10	.....
3 1/2	.0078	.....	151	35.5	11.7	3.07	.96	.26	.13	.....
4	.0089	.....	191	45.1	14.9	3.88	1.23	.33	.16	.....
4 1/2	.010	.....	237	57.5	18.3	4.77	1.51	.41	.20	.....
5	.011	.....	285	66.9	22.1	5.78	1.82	.49	.23	.07
6	.013	.....	.....	92.4	30.0	7.96	2.50	.68	.33	.10
7	.016	.....	.....	121	39.9	10.5	3.29	.90	.43	.13
8	.018	2-1/2	3	153	50.5	13.3	4.17	1.13	.54	.16
9	.020	.....	.....	.....	62.3	16.3	5.14	1.39	.67	.20
10	.022	.11	.04	3-1/2	75.1	19.6	6.20	1.68	.77	.24
15	.033	.21	.08	.....	.....	40.0	12.7	3.44	1.65	.50
20	.045	.36	.13	.06	.....	67.0	21.1	5.71	2.75	.83
25	.056	.53	.19	.09	.....	.....	31.2	8.50	4.06	1.24
30	.067	.73	.26	.13	.....	.....	43.0	11.7	5.59	1.70
35	.078	.96	.34	.17	4	.....	56.8	15.4	7.32	2.24
40	.089	1.22	.43	.22	.12	71.9	19.5	9.35	2.84	
45	.10	1.50	.53	.27	.15	5	.....	23.9	11.5	3.49
50	.11	1.81	.64	.32	.18	.....	.....	28.8	13.8	4.20
60	.13	2.49	.89	.45	.24	.08	.....	39.7	19.2	5.78
70	.16	3.26	1.16	.58	.32	.11	.....	52.3	25.1	7.64
80	.18	4.12	1.47	.73	.40	.14	6	65.9	31.8	9.64
90	.20	5.09	1.81	.91	.49	.17	.....	.....	39.4	11.9
100	.22	6.14	2.18	1.08	.60	.20	.09	.....	47.1	14.3
120	.27	8.50	3.02	1.51	.83	.28	.12	.....	65.0	19.7
140	.31	11.1	3.95	1.97	1.08	.37	.15	.....	85.7	26.0
160	.36	14.2	4.99	2.49	1.37	.47	.19	8	.....	32.7
180	.40	17.3	6.15	3.08	1.68	.57	.24	(.322)	.....	.....
200	.45	20.9	7.41	3.70	2.04	.69	.29	.08	.....	.....
220	.49	24.6	8.75	4.39	2.40	.82	.34	.09		.....
240	.53	28.7	10.2	5.14	2.81	.96	.40	.11	10	.....
260	.58	33.2	11.8	5.92	3.24	1.10	.47	.12	(.365)	.....
280	.62	37.7	13.5	6.72	3.66	1.25	.52	.14	.....	.....
300	.67	42.7	15.2	7.62	4.13	1.41	.58	.16	.05	
350	.78	.....	20.0	9.95	5.48	1.86	.78	.21	.07	12
400	.89	.....	25.4	12.7	6.92	2.35	98	.27	.09	(.375)
450	1.00	.....	31.8	15.6	8.50	2.88	1.20	.33	.11	.....
500	1.11	.....	38.6	19.0	10.3	3.49	1.45	.39	.13	.06
550	1.23	.....	.....	22.8	12.3	4.13	1.72	.47	.16	.07
600	1.34	.....	.....	26.8	14.4	4.82	2.00	.54	.18	.08
650	1.45	.....	.....	31.1	16.7	5.56	2.31	.63	.21	.09
700	1.56	.....	.....	35.8	19.3	6.41	2.64	.72	.24	.10
750	1.67	.....	.....	.....	22.2	7.25	2.99	.81	.27	.12
800	1.78	.....	.....	.....	24.8	8.19	3.35	.90	.30	.13
850	1.89	.....	.....	.....	27.8	9.19	3.75	1.00	.34	.14
900	2.01	.....	.....	.....	31.2	10.2	4.17	1.11	.37	.16
950	2.12	.....	.....	.....	34.2	11.3	4.61	1.22	.41	.17
1,000	2.23	.....	.....	.....	37.6	12.5	5.08	1.35	.45	.19
1,100	2.45	.....	.....	.....	.....	14.9	6.10	1.60	.53	.23
1,200	2.67	.....	.....	.....	.....	17.5	7.22	1.87	.62	.26
1,300	2.90	.....	.....	.....	.....	20.4	8.40	2.20	.72	.30
1,400	3.12	.....	.....	.....	.....	23.4	9.65	2.52	.83	.35
1,500	3.34	.....	.....	.....	.....	26.7	10.9	2.88	.94	.40
1,600	3.56	.....	.....	.....	.....	30.1	12.3	3.24	1.07	.44
1,700	3.79	.....	.....	.....	.....	33.7	13.8	3.64	1.19	.49
1,800	4.01	.....	.....	.....	.....	37.6	15.4	4.05	1.33	.55
1,900	4.23	.....	.....	.....	.....	41.5	17.0	4.47	1.46	.61
2,000	4.46	.....	.....	.....	.....	45.6	18.7	4.92	1.61	.67
2,200	4.90	.....	.....	.....	.....	.....	22.4	5.85	1.93	.81
2,400	5.35	.....	.....	.....	.....	.....	26.2	6.88	2.27	.95
2,600	5.79	.....	.....	.....	.....	.....	30.2	8.00	2.64	1.08
2,800	6.24	.....	.....	.....	.....	.....	.....	9.16	3.04	1.26
3,000	6.68	.....	.....	.....	.....	.....	.....	10.5	3.46	1.44
3,500	7.80	.....	.....	.....	.....	.....	.....	13.9	4.64	1.93
4,000	8.91	.....	.....	.....	.....	.....	.....	17.8	5.91	2.46
4,500	10.03	.....	.....	.....	.....	.....	.....	22.2	7.36	3.06
5,000	11.14	.....	.....	.....	.....	.....	.....	27.1	8.92	3.72
5,500	12.26	.....	.....	.....	.....	.....	.....	32.5	10.7	4.47
6,000	13.37	.....	.....	.....	.....	.....	.....	38.0	12.6	5.22
7,000	15.60	.....	.....	.....	.....	.....	.....	.....	16.7	7.00
8,000	17.83	.....	.....	.....	.....	.....	.....	.....	21.3	8.95
9,000	20.05	.....	.....	.....	.....	.....	.....	.....	26.6	11.1
10,000	22.28	.....	.....	.....	.....	.....	.....	.....	32.2	13.5
12,500	27.85	.....	.....	.....	.....	.....	.....	.....	.....	20.5
15,000	33.42	.....	.....	.....	.....	.....	.....	.....	.....	28.7
17,500	39.00	.....	.....	.....	.....	.....	.....	.....	.....	38.3

Computed for new pipe, exclusive of losses at joints, valves, etc.
Temperature of water 75°F.

QUESTION of the Month

If you don't have the answer to one of your problems, maybe someone else does. That's the purpose of this "idea exchange"

QUESTIONS ON heating, piping and air conditioning asked by HPAC's readers are answered here each month. We hope you find these practical comments of regular interest. Why don't you contribute either a question, or an answer to a published question, for next month's issue? We'll be glad to hear from you. Just address the Editor, Heating, Piping & Air Conditioning, 6 N. Michigan Ave., Chicago 2, Illinois.

ONE BIG PUMP OR FOUR SMALL ONES?

IN THE AUGUST HPAC, "E.R." asked for comment on the use of one large pump, as compared to four smaller ones, in a four-zone radiant panel heating system for a new church.

We have designed radiant panel systems for a number of churches. Some systems were designed with one pump but most of them incorporate multiple pumps, for the following reasons:

1) It is less expensive to zone the church into four zones using four circulating pumps rather than one pump and four motorized valves. Controls are simpler with four pumps.

2) With four pumps the piping can be arranged so that in an emergency, such as a pump failure in any one zone, the four zones could be handled by three pumps and heating could be maintained in every area until the disabled pump was put back in operation.

3) If the pump fails in a "one pump installation", the entire building is without heat.

4) It is easier to repair and find spare parts for the smaller pumps than it is for one large pump in case of a pump casualty.

5) It is almost always possible to install four small pumps by nesting them in a boiler room without requiring any more space than one larger pump.

6) Pipe sizes are smaller in a multiple pump installation and piping is simpler to install.

7) A four pump job would require only single phase power. One large pump might require multiphase current, which is not always available.

In the last analysis, the determining factors in making a selection of the type of system to be used will depend on the items listed above, plus the building layout, pipe space, building construction and the size of the installation.—F.S.D.

RATINGS FOR OBSOLETE RADIATORS

A PUBLISHED request from a reader of HPAC asked for a source of information on ratings of old style, column type, cast iron radiators. By a coincidence, we were at that time in the process of compiling a roughing-in data booklet for The National Radiator Co. cast iron radiators, incorporating exactly the information which this reader requested.

The purpose of the booklet is to provide dimensions, capacities, and other data on both current and obsolete types of radiators. It can be used to select radiation for new installations, or to determine the amount of installed radiation on existing installations, permitting accurate selection of a boiler of suitable capacity to be made.

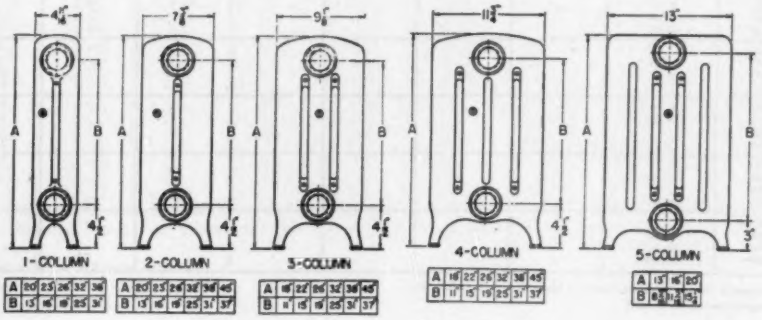
Included in the booklet are data on modern small tube radiation, discontinued older style large tube radiation, obsolete column radiation,

RATINGS for obsolete column radiators

No. of columns	Square feet per individual section									
	13" Hgt.	16" Hgt.	18" Hgt.	20" Hgt.	22" Hgt.	23" Hgt.	26" Hgt.	32" Hgt.	38" Hgt.	45" Hgt.
1				1½		1-2/3	2	2½	3	
2				2		2-1/3	2-2/3	3-1/3	4	5
3			2¼		3		3¾	4½	5	6
4			3		4		5	6½	8	10
5	3	3¾		5						

These ratings are for "Premo" column radiators. For other makes of column radiators of generally similar proportions the same ratings can be used.

Water content of column radiators (average of all sizes) is 0.188 gallon per square foot of cataloged surface.



DIMENSIONS OF OBSOLETE column radiators of one manufacturer. Accompanying table gives their ratings

and a wall radiator which has been discontinued.

In this manual are shown dimensional drawings and ratings in square feet per individual section of the most generally used sizes of one-, two-, three-, four-, and five- column radiators (reproduced herewith). Since there was a reasonable degree of similarity in general dimensions of most makes of column radiators, the data given can be used for radiation produced by other of the manufacturers.

The average water content of the various radiators is also shown as this information is frequently requested.—J. W. H.

WHY DOES PAINT PEEL FROM THIS STEEL STACK?

You are invited to answer the following question from a reader of HPAC. Please address your reply to the Editor, Heating, Piping & Air Conditioning, 6 N. Michigan Ave., Chicago 2.

"A 225 hp HRT boiler is served by a riveted metal stack 42 in. in diameter and 70 ft high. The boiler has a dutch oven in which green sawdust and shavings are burned. The problem I have for HPAC's readers is how to keep paint on this stack. Figs. 1 and 2 illustrate the present condition of the surface. Briefly, the stack's history is as follows:

"The stack was manufactured, primed, and erected four years ago. It was then painted with a paint which was supposed to withstand a stack temperature of 1000 F — but it began to peel in only a few weeks.

"Reliable painters did a good job of removing loose paint and scale, and then applied the highest grade of the same paint — but rust began to show through in just a few weeks. More scraping followed. The next paint used was manufactured by another company, and it was also advertised as good for 1000 F. After a few weeks, it too began to deteriorate and rust began to break through the paint.

"Two patch areas were cleaned down to bare metal last June, and a 600 deg paint manufactured by a third company was applied. One of the patch areas is about 12 ft above the roof and appears in Fig. 2. This photo was taken 10 weeks after the patch was painted and while it is holding better than any of the other paint films, it is still not satisfactory. The second patch area is under the roof and is still in fairly good condition.

"The peeling does not always start at the joints, but appears pretty generally over the entire area from the roof to the top of the stack. There are no noticeable streaks under the joints. There is about 10 ft of stack under the roof and this section still looks pretty good after the paint on the remainder of the stack is about gone.

"The clean area on the bottom of Fig. 1 is a skirt that fits around the stack where it goes through the roof. It is, of course, exposed to essentially the same weathering effects as the stack but the paint always holds up well on this flashing.

"A representative of one of the paint manufacturers used a crayon test on the stack and reported that the surface temperature did not exceed 600 F.

"Perhaps some of HPAC's readers have solved this type of problem and can tell me how to get reasonable life from a coat of paint on a steel stack such as this one."—F.B.M.

FIG. 1—SKIRT AROUND STACK where it goes through roof is exposed to same weathering but the paint holds up well on this flashing

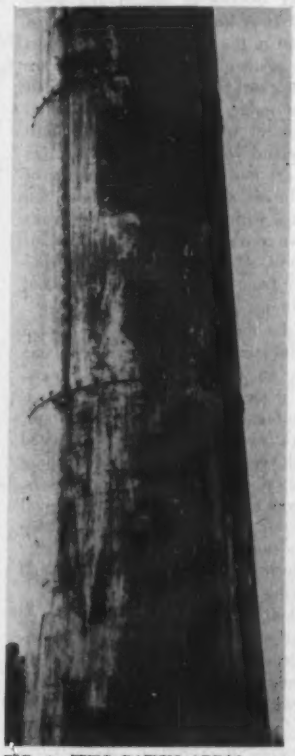


FIG. 2—TWO PATCH AREAS were cleaned down to bare metal last June and a 600 deg paint was applied. Photo was taken 10 weeks later

The Law and Your Profits

Trade Secrets

SMART QUIRKS in design and technical know-how are tricky things to defend in the courts. If your underlying system and basic principles are of such sort that they can be revealed to the judge, you stand a fairly good chance of winning should you have to defend your rights. However, as you are more or less at the mercy of employees and associates whom you entrust with your trade secrets, your safest course lies in the selection of persons whose scruples will forbid them from picking your mind and becoming your competitors.

Take the case of the Windstorm Engineering Co. — a fictitious name —as an example. For six years, this company had been developing, manufacturing and selling blowers of a certain type. Among the trusted employees were two ambitious young fellows — let's call them Messrs. George and Charles — whose special function was to put into practice Windstorm's secret and presumably exclusive methods of planning and making these blowers.

One day Messrs. George and Charles decided to capitalize the experience and knowledge they had gained while employed by Windstorm. Accordingly, they handed in their resignations and formed the Vorticalic Design & Mfg. Co. (also a fictitious name). Before long, Windstorm was up against stiff competition in the shape of its own blower specialty turned out by Vorticalic, and suffered loss of business in consequence. At least, such was the complaint of Windstorm when it sued Vorticalic in the state courts.

The defendants denied that they had obtained, or were using, any of Windstorm's "trade secrets". On the contrary, they insisted that in the manufacture of their blowers they were guided wholly by engineering principles common to all and therefore not the exclusive property of Windstorm or anyone else.

The trial court found in favor of the defendants, and Windstorm carried the case to the district court of appeal. That tribunal, in its opinion affirming the lower court's decision, noted these seemingly elementary facts:

The blowers circulate air under pressure. Windstorm's blower is a single unit — "motor, fan blades, vanes and assembly enclosed within a pipe and designed to deliver a continuous stream of moving air in a defined channel."

Despite this apparent simplicity, 1038 pages of testimony were read by the appeals court, which found the evidence conflicting but saw substantial basis for the lower court's decision in favor of Messrs. George and Charles. In particular, the higher tribunal approved the striking out of the answer to the following question by Mr. Quick, one of Windstorm's witnesses:

"Could the propeller shown on defendants' Exhibit K have been designed" by one of the Windstorm "air designing methods?"

Since there was no evidence before the court of Windstorm's methods, the question was deemed as "of no foundation".

The gist of the decision seemingly lies in the following "colloquy" between the court and Windstorm's lawyer (italics are ours):

Counsel: "Do I understand I will not be permitted to lay any further foundation as to" Mr. Quick's "qualifications or knowledge?"

The Court: "There is no question" but that Mr. Quick "is very ably qualified to testify in all matters pertaining to the plaintiff's blowers as well as any other blower. However, that is not the necessary foundation, as I see it. The *necessary foundation* is the *system* used by the plaintiff to arrive" at his "deductions or results. Otherwise there would be no means of cross-examining this witness on his calculations."

The court's ruling against Windstorm was based on "lack of essential foundational proof." One gathers, however, that the cause of Windstorm's failure to gain its case perhaps lies even deeper. Either Windstorm did not possess or failed to place in evidence (through oversight or policy) the underlying system and basic principles that governed its design. These principles, not the details that filled so many pages of evidence, were apparently what the court was seeking to afford Windstorm proper protection for its "trade secrets" as against the competition of which it complained.

[Note: While this discussion applies to an actual case, it must be remembered that legal rules vary in different states.]

William Hurd Hillyer, author of this article, is a contributor to a number of banking and financial publications and has written several books on business. A former vice president of the Atlanta Trust Co., his work there gave him a practical legal background.

Protect Your Home and Family

PREVENT FIRES!

Fire Prevention Week

October 7-13

Heating, Piping & Air Conditioning

THE AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS

JOURNAL *SECTION*

Removal of Bacteria and Bacteriophage from the Air by Electrostatic Precipitators and Spun Glass Filter Pads

By H. M. Decker*, F. A. Geile**, H. E. Moorman†, and C. A. Glick†, Frederick, Md.

SUMMARY—There are increasing demands for highly effective air filtration systems for hospitals, industrial installations, and research laboratories where air must be relatively free of biological organisms before, during, or after a process. The combination of an electrostatic precipitator and a spun glass fiber filter pad can be used to obtain 99 to 100 percent removal of bacteria and viruses. A 99 percent removal can also be obtained by using two filter pads instead of the electrostatic precipitator and the filter pad. The effectiveness of the filtering devices is shown by tests reported.

MUCH equipment has been devised to eliminate dust, pollen and smoke from the air, but relatively little effort has been made to remove bacteria and viruses. The purpose of this investigation was to determine the arrestance, *i.e.*, air filtration effectiveness, that could be obtained from electrostatic precipitators and spun glass filters in separate and combined application to remove bacteria and viruses from the air. The arrestances realized in tests would then determine the possible applications of such devices.

There are increasing demands for highly effective air filtration systems for hospitals, industrial installations, and research laboratories where air must be relatively free of biological organisms before, during, or after a process. Common bacteriological laboratory techniques such as pipetting from vessels or mixing in a blending device have been found[1,2,3] to permit the escape of organisms into the room air. Various procedures, in fume hoods, in special equipment, or in buildings where work with infectious organisms is performed, sometimes pollute the air which, therefore, should be decontaminated. Furthermore, an air supply relatively free of microscopic-sized particles and micro-organisms is required in factories given to the manufacture of precision instruments or in pharmaceutical plants engaged in the production of antibiotics, such as penicillin, or in filling ampules.

The electrostatic filter is credited with removing 70 to 100 percent of bacteria, yeast, or molds from air, according to various authorities.[4,5,6,7]

A gas-fired incinerator is used to sterilize air in some locations[8], while in others an electric grid gives good results[9]. Ultraviolet rays[10,11,12] and steam jets[13] are likewise serviceable. No one method is satisfactory at all times, because of differences in air capacity, size, economy, difficulty of maintenance and bacterial filtering efficiency.

This paper reports the arrestances of two electrostatic precipitators and three types of spun glass filters in removing *Serratia indica* and *Escherichia coli* T-3 bacteriophage from the air stream. *Serratia indica* is a harmless small elongated bacterial organism about 1 micron in length and one-half micron in thickness. *Escherichia coli* T-3 bacteriophage is also a harmless virus organism, somewhat spherical in shape, which ranges in size from 0.02 to 0.05 microns.

Electrostatic Filter

In the electronic method of air purification, particles receive an electrostatic charge of definite polarity by ionization, and are then removed by an opposite electrical attraction.

*Sanitary Engineer, Camp Detrick.
**Air Conditioning Engineer, Camp Detrick. Member of ASHVE.
†Bacteriologist, Camp Detrick.
[1]Exponent numerals refer to References.

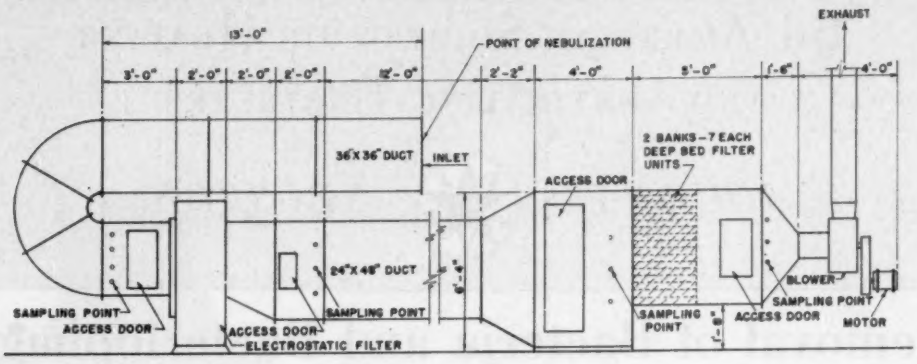


Fig. 1—Air filtration unit

Electrostatic filters have been in use for 15 years or longer, and while there are at least four large manufacturers of different models, the basic principle of operation is the same for all units. It is probable that the results reported in this study will apply to other electrostatic precipitators, provided the arrestance (as measured by the *National Bureau of Standards* discoloration method) equals that of the test unit.

The discoloration test has shown that the performances of electrostatic filters of different manufacturers are similar. However, the exact arrestance of the electrostatic unit becomes less important when it is understood that it is actually being used as a good pre-filter to give longer life to the secondary fine spun glass filter.

Two electrostatic filters were used in these studies and are referred to as Model E and Model F. The arrestance of each model (as determined by the discoloration method) was 90 percent at an air flow of 400 fpm.

Model F differed from Model E in three respects: (1) plate thickness was reduced in Model F; (2) flat plates were used in Model F for ground electrodes instead of tubular struts; and (3) the spacing between the ionizing wire and ground electrodes was adjusted in Model F to increase the charge intensity on the particle.

Fig. 1 shows the method of air sampling used to determine the bacterial arrestance of the electrostatic precipitators. Two sieve air samplers[14] were placed in the ductwork of the filter in front of the precipitator unit, and two behind the unit. A suspension of *Serratia indica* was atomized from a nebulizer placed at the inlet portion of the ductwork. The concentration of organisms before the filter was so adjusted that there were 85 to 240 organisms per cubic foot of air. This low concentration was used to approximate the order of magnitude of bacteria in air under the actual conditions encountered in schools and hospitals, where counts of 23 per cubic foot of air have been reported[15]. In addition, the filters were tested with much higher concentrations through the use of a cloud of bacteriophage having an average of 3.1×10^8 particles per cubic foot. Air was drawn through each sampler for three minutes at the rate of 1 cfm. The organisms entering the sieve sampler were impinged on a growth medium consisting of corn steep agar. The organisms were allowed to grow at a temperature of 30 C (86 F) for 24 hr and then were counted. The arrestance of the filter was calculated by comparing the bacterial count of the air before and after filtration.

The results are summarized in Fig. 2. The Model E electrostatic precipitator ranged from 89 to 96 percent efficiency in the removal of *Serratia indica* from the airstream, and averaged 92 percent. The Model F electrostatic precipitator had an arrestance of 96 to 100 percent, and averaged 97 percent for 23 individual tests.

Spun Glass Filter

Although the removal of 89 to 100 percent of bacteria in the air is sufficient for many purposes, an attempt was made to improve this arrestance. Mechanical filters of untreated spun glass were treated. The spun glass pads were composed of fibers ranging in diameter from 1.25 to 2.75 microns. Three types of spun glass material were tested and were classified as number 25-FG, 50-FG and 100-FG for test purposes. Number 25-FG had a pad thickness of 0.5 in. and a fiber diameter of 2.75 microns. Number 50-FG was 0.5 in. thick and had a fiber diameter of 1.25 microns. Number 100-FG was 1 in. thick and had a fiber diameter of 2.75 microns. Respective pad resistances to air flow at 20 fpm were 0.12, 0.48 and 0.22 in. of water.

The spun glass pads were installed in a filter unit containing wedge shaped pockets supported in a grid type frame. Each frame could hold one to five pockets. In the standard type frame holding 5 pockets, the total net filtering area was approximately 50 sq ft, and the normal capacity was 1000 cfm. The pockets were so designed that filtering ma-

terial from one-half to one inch in depth could be placed in them.

Initial tests were conducted on a surface area of 20 sq ft with an air volume of 400 cfm, equivalent to 20 fpm through the filter. After the data were assembled and analyzed, however, it was decided to test a larger filter with a capacity of 2800 cfm, but at the same linear flow of 20 fpm. Unless it is otherwise noted, results given in this paper refer to the 400 cfm filter.

The method of sampling was similar to that described for testing the efficiency of the electrostatic precipitator.

The results as summarized in Figs. 2 and 3 are as follows:

1. The bacterial arrestance of the 25-FG material varied from 23 to 90 percent. The average bacterial arrestance was 60 percent for 15 series of tests.

2. The arrestance of the 50-FG material was much higher. With the 400 cfm filter and a single half inch layer of spun glass, the range of efficiency in 20 tests was 88 to 97 percent, with an average of 94. When two layers of spun glass were used, the arrestance in 14 tests was 93 to 100 percent, with an average of 97. These results, shown in Fig. 2, indicated considerable variation. Later work, however, indicated that higher and more consistent arrestances can be expected. The early variations were due to poor sealing of the material in the filter frames.

With the 2800 cfm filter (Fig. 3) and a single layer of spun glass, the average arrestance in 45 tests was 99 percent. With a double layer, it was also 99 percent.

3. The 100-FG material was 73 to 88 percent effective, and the average of 10 tests on the 400 cfm filter was 81 percent (Fig. 2). With the 2800 cfm filter, the arrestance was 89 percent for 44 individual tests (Fig. 3).

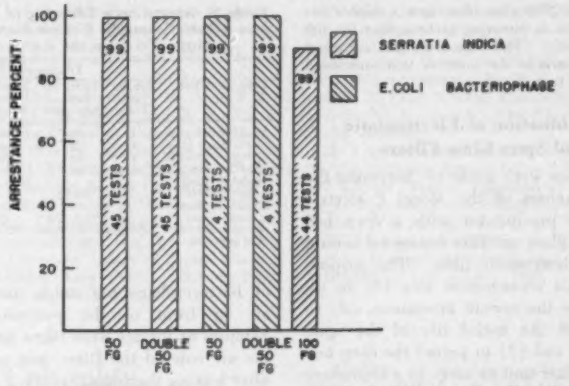


Fig. 3—Comparison of average arrestances obtained in removing *Serratia indica* and *Escherichia coli* bacteriophage T-3 with spun glass filters (2800 cfm filter)

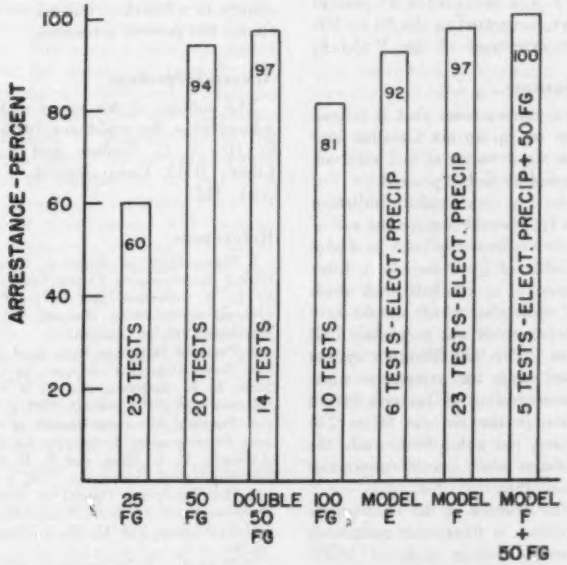


Fig. 2—Comparison of average arrestances when removing *Serratia indica* with spun glass filters and electrostatic precipitators (400 cfm filter)

Glossary

ampule	=	a small hermetically sealed vessel for holding pharmaceutical substances.
bacteria	=	a widely distributed group of one-celled micro-organisms, some of which are disease producing.
bacteriophage	=	a virus organism which is a parasite of bacteria.
liquid impinger	=	a sampling device used to collect organisms from the air by passing air through a liquid confined in a vessel.
pipetting	=	the act of drawing and releasing a liquid through a narrow glass tube.
plaque count	=	a bacteriological procedure for detecting the number of bacteriophage organisms present.
sieve sampler	=	a sampling device used to collect organisms in the air by impingement of the organisms onto a growth medium.
viruses	=	extremely microscopic agents, some of which cause disease.
blender	=	mechanism used to mix organisms into solution.

The 2800 cfm filter had a higher arrestance in removing bacteria than the 400 cfm filter. The reason for this increased arrestance is the same as that mentioned under item 2.

Combination of Electrostatic and Spun Glass Filters

Tests were made to determine the arrestances of the Model F electrostatic precipitator with a deep bed spun glass air filter connected behind the electrostatic filter. The purpose of this arrangement was (1) to increase the overall arrestance, (2) to extend the useful life of the spun glass and (3) to permit the deep bed air filter unit to serve as a secondary mechanical barrier and safety factor which would prevent the organisms from escaping to the atmosphere on failure of the electrostatic precipitator.

The combination of the Model F electrostatic precipitator followed by one layer of 50-FG material produced an arrestance of 100 percent in five different tests under the conditions tested (Fig. 2).

Filtration of Bacteriophage

Information was also desired about the effectiveness of electrostatic precipitators and spun glass filters in removing viruses. Viruses are much smaller than bacteria. *Escherichia coli* T-3 bacteriophage virus was used in these studies. It ranges in size from 0.02 to 0.05 microns. The quantitative assay of bacteriophage particles recovered was determined by a bacteriological method known as a plaque count[16]. Three types of air samplers were used. These were: (1) liquid impingers in which air was passed through a suitable collecting liquid, (2) sieve samplers with a solid growth medium as previously described, and (3) sieve samplers which used a liquid growth medium.

In each test, samplers were placed directly in front of, and also behind, the electrostatic precipitator and spun glass filter being tested.

A suspension of 1.8×10^8 to 7.5×10^9 bacteriophage particles per cubic centimeter of liquid was atomized from a nebulizer. This produced a concentration of 3.1×10^6 particles of bacteriophage per cubic foot of air in front of the precipitator. Samples of the air were taken before the air entered the filter, and again after leaving the filter.

Table 1—Approximate Efficiency of Various Filters Removing *E. Coli* Bacteriophage T-3 from the Air[a]

Type of Filter	Number of Tests	Efficiency — % Tested by Liquid Impinger	Tested by Sieve Sampler
25-FG Spun glass	1	30	38
50-FG Spun glass	1	98	99
50-FG + 50-FG	1	99	99
100-FG Spun glass	1	90	90
Model E Electrostatic Filter	1	89-95	80-89
Model F Electrostatic Filter	1	95.7-100	99.5

[a]400 cfm filter

Results of counting the bacteriophage particles collected by the air samplers are shown in Figure 3 and Table 1. Table 1 represents the initial tests on a 400 cfm filter, while the work summarized by Fig. 3 represents a 2800 cfm filter. The 25-FG spun glass filter had an efficiency of only 30 to 38 percent. One layer of 50-FG spun glass removed 98 to 99 percent of the organisms, while two layers removed 99 percent. The 100-FG material rated about 90 percent. The electrostatic precipitator Model E was about 80 to 95 percent effective, compared to the 96 to 100 percent arrestance of the Model F.

Conclusions

These studies show that it is possible to set up an air filtration system having a bacterial and viral arrestance of 99 to 100 percent.

A practical commercial installation of this type would require the use of an electrostatic precipitator as a prefilter followed by a secondary filter composed of a one-half inch thick pad of spun glass which should have a fiber diameter not exceeding 1.25 microns. This air filtration system obtained such an arrestance when the concentration of bacteria before filtration in the air was 85 to 240 organisms per cubic foot, while the virus count was 3.1×10^6 organisms per cubic foot.

In the absence of the electrostatic precipitator, a filter unit containing two one-half inch pads of 50-FG spun glass and having a capacity of 2800 cfm at a linear air flow of 20 fpm removed an average of 99 percent of the bacteria and 99 percent of the virus organisms. It would appear that other bacteria and viruses would be removed equally well.

These arrestances will permit discharge of air originally containing infectious bacteria and viruses to the outside atmosphere, but will not permit recirculation of the air.

This type of air filtration would apply satisfactorily to all ordinary situations, such as in hospitals and industrial concerns, except in extremely specialized circumstances, as in the case of some research institutions where organisms are handled in unusual numbers (millions) and accidentally or deliberately might be released into the air.

Lesser arrestances, approaching 92 to 95 percent, should be satisfactory for many industrial applications that do not involve organisms infectious for man.

In view of the data presented, the demand for air filtration equipment for the removal of bacteria and viruses is increasing, and further development work by the air cleaning industry is warranted. Special emphasis should be devoted to development of a filtration unit which will obtain 100 percent arrestance.

Acknowledgement

The authors of this paper wish to acknowledge the assistance rendered by Dr. A. G. Wedum and Ralph Elbert, HM2, Camp Detrick, Frederick, Md.

References

1. Photography of Airborne Particles During Bacteriological Plating Operations, by K. R. Johansson and D. H. Ferris (*Journal of Infectious Diseases*, Vol. 78, May-June 1946, pp. 238-252).

2. Potential Infectious Hazards of Common Bacteriological Techniques, by L. R. Stein, R. E. Anderson, and N. H. Gross (*Bacteriological Proceedings*, 1949, p. 10).

3. Potential Infectious Hazards of Common Bacteriological Techniques, by R. E. Anderson, M. L. Moss, and N. H. Gross (*Bacteriological Proceedings*, 1950, p. 58).

4. Air Filters for Control of Airborne Bacteria, by J. M. Dalla Valle (*Heating and Ventilating*, Vol. 41, No. 4, 1944, pp. 54-59).

5. Methods of Maintaining Bacterial Purity of Air, by R. E. O. Williams (Presented at the Sessional Meeting, Dec. 8,

1948, *Institution of Heating and Ventilating Engineers*, London, England).

6. Automatic Electronic Precipitators (American Air Filter Co. *Bulletin No. 250E*, Louisville, Ky.).

7. The Efficiency of an Electrostatic Filter in Removing Airborne Micro-organisms, by J. J. Jezeski (Unpublished paper, Camp Detrick, Frederick, Md.).

8. Reproduction of Human Ulcerative Pulmonary Tuberculosis in Rabbits by Quantitative Natural Airborne Contagion, by M. B. Lurie and S. Abramson (*Proceedings of the Society for Experimental Biology and Medicine*, Vol. 69, December 1948, p. 531).

9. A Laboratory Building for Study of Highly Infectious Diseases (*Engineering News-Record*, Vol. 139, Oct. 2, 1947, pp. 460-463).

10. Air Contamination and Air Sterilization, by E. C. Robertson, E. M. Doyle, F. F. Tisdale, L. R. Koller, and F. S. Ward (*American Journal of Diseases of Children*, Vol. 58, 1939, pp. 1023-1038).

11. The Importance of Airborne Pathogenic Bacteria in the Operating Room: A Method of Control by Sterilization of the Air with Ultraviolet Radiation, by Derwyl Hart (*Aerobiology*, 1942, pp. 186-192).

12. Ultraviolet Lamps to Control Fungi, by Rudolph Nagy (*Food Industries*, Vol. 19, 1947, pp. 928-929).

13. Steam Jet Decontamination (William Burrows' personal correspondence, *University of Chicago*, June 13, 1950).

14. A Sieve Device for Sampling Airborne Micro-organisms, by H. G. DuBuy and L. R. Crisp (*Public Health Reports*, Vol. 59, No. 6, June 30, 1944, Report No. 25, pp. 829-832).

15. A Quantitative Bacterial Analysis of the Air of Operating and Delivery Rooms and Related Areas of a General Hospital, by K. MacDonald (*American Journal of Hygiene*, Vol. 31, No. 2, 1940, pp. 74-84).

16. *Textbook of Bacteriology*, by William Burrows (Chapter 38, Bacteriophage, W. B. Saunders Co., 15th Edition, 1949, pp. 916-925).

Society Supports Columbia Research Fellowship

The story of a research fellowship — and the part played by the Society in making it possible — was disclosed recently by Columbia University following a study intended to show just what a "research fellow" does and how his work may benefit science, industry, and the public.

The research fellowship selected for investigation was the *William Petit Trowbridge Fellowship in Engineering*, one of many granted each year. The research being conducted under the fellowship, partially financed by a $1000 grant from the Society for supplies and equipment, is devoted to investigation of the reasons behind the peculiar movements of moisture in the soil — a condition which for many years has plagued agronomists, soil experts, and engineers concerned with tunnel excavation, underground coils and cables, and foundations. The "fellow" who has been awarded this year's fellowship is Raymond Eisenstadt, 30 year old veteran from Brooklyn, N.Y.

A candidate for the doctoral degree in engineering, Mr. Eisenstadt returned to his studies three years ago because he desired to teach and conduct research in mechanical engineering. He holds the New York State Professional Engineers License, as well as the Bachelor of Mechanical Engineering degree from C.C.N.Y. (1941) and a master's degree in that field from Columbia (1943).

Under the fellowship, Mr. Eisenstadt is trying to determine the mechanism by which temperature differences between two adjacent sections of soil cause a flow of moisture from one area to the other. The physical action has been known to scientists for many years, but the mechanism causing the moisture flow has not been definitely proven.

To imitate conditions on a controlled basis, a "soil model" has been assembled. It consists of an insulated cylinder several feet long filled with tiny spherical glass beads, each one a hundreth of an inch in diameter. The temperature of the soil model is carefully regulated to within 0.2 F deg.

Moisture, a solution of radioactive cobalt nitrate, is introduced into the model. By noticing the differences in radioactivity after a given period of time at various locations along the cylinder, a clue to the amount of moisture transfer that occurs at varying temperatures and saturations can be obtained. From these statistics, it is expected that scientists will be able to discover whether the moisture migration is due to alternate evaporation and condensation, capillary action, or to a combination of these physical causes.

The research in moisture migration at Columbia is under the direction of Associate Professor William A. Hadley, of the University's Department of Mechanical Engineering. Professor Carl F. Kayan, a member of the Society and past president of the New York Chapter, is executive officer of the Department.

NATURAL VENTILATION STUDIED

Studies of the natural ventilation of buildings have been initiated at the Engineering Experiment Station, Texas A. & M. College, College Station, Tex.

These studies are part of a program of research directed toward obtaining data from which a scientific approach to total environmental control of buildings can be developed. Three of the principal subjects being studied are: natural lighting, natural ventilation, and sound conditioning. The possibility of using models of structures for predetermining natural ventilation is being investigated by comparison of air flow conditions obtained in models and in full size structures.

Two publications which will be of interest to ASHVE members have just been published, and may be obtained from the Texas Engineering Experiment Station. These publications are: Research Report No. 22, *Some General Considerations in the Natural Ventilation of Buildings*, by W. W. Caudill, S.E. Crites, & E. G. Smith; and Research Report No. 26, *The Feasibility of Using Models for Predetermining Natural Ventilation*, by Elmer G. Smith.

New Environment Laboratory to be Inaugurated With Inspection Tours November 1 and 2

The Society's new Environment Laboratory, which promises to open many new horizons in ASHVE Research, will be unveiled for members, executives, and the press during a two-day inspection at the Research Laboratory, 7218 Euclid Ave., Cleveland, Ohio, November 1 and 2.

Designed primarily for research in human comfort conditions and the development of data for the design and installation of panel heating and cooling systems, the new Environment Laboratory now being completed will be open for inspection both days. A group of Society Officers, committee members, and executives interested in the support and sponsorship of research in heating, ventilating, and air conditioning will inspect the new Environment Laboratory on November 1, and on November 2 there will be a program of talks on the new facility.

Pres. Lauren E. Seeley will greet guests, and I. W. Cotton, Chairman, Committee on Research, and Committee members; Cyril Tasker, Director of Research, and Laboratory staff members; and P. B. Gordon, Chairman, TAC on Panel Heating and Cooling, and committee members will all be on hand to explain the operation of the new room.

Prior to inspecting the new Environment Laboratory on November 1, the invited Officers will attend a luncheon at the Hotel Statler, where they will hear an address, *The Environment of Our Industry*, by Cloud E. Wampler, president of the Carrier Corp. President Seeley will preside at the luncheon and will welcome the guests. I. W. Cotton, Chairman, Committee on Research, will also address the group, briefing them on the new facility preparatory to their inspection trip.

The newest and one of the most significant of the Society's facilities for fundamental research, the Environment Laboratory is evidence of the Society's response to the need for reliable design data for panel heating and cooling applications.

Lauren E. Seeley
Durham, N.H.

The origin of the Environment Laboratory dates back to early 1947, when more than 100 representative engineers from consulting offices, government offices, universities, trade associations, and industry gathered for a general conference in Cleveland to discuss the need for special research facilities.

Bachrach

Cloud E. Wampler
Carrier Corp.

The consensus was that the important task of program coordination and development of adequate design data through research should be a Society undertaking. Consequently, in the latter part of the same year, a TAC on Panel Heating and Cooling was formed by the Committee on Research, to direct overall technical activities for the research program. The overall program eventually developed by this TAC subdivided the general research problem into four major studies: (a) heat distribution within and behind the panel; (b) heat transfer between the panel and the space; (c) comfort conditions; and (d) controls.

The early discussions determined that, in order to carry on the proposed program, it would be necessary to construct a full sized room with dimensions comparable to those found in actual buildings. In such a room, it was established, temperatures of all surfaces, and, in some instances, portions of surfaces, should be under control to permit operation at any desired temperature.

It later became apparent that the Environment Laboratory also could be used for study of radiation and comfort relationships, and it was then decided that two rooms would be necessary to facilitate these comfort studies.

Planning was started in 1948, continued through 1949, and actual construction begun in 1950. The room as it now stands occupies an interior area of about 25 feet in length and 12 feet in width and has an adjustable ceiling to permit height regulation up to 12 feet. The Environment Laboratory is so designed as to permit division into two rooms, if desired.

Society members who are located in Cleveland or others who find it convenient to visit Cleveland on November 2, are invited to come to the session at the Hotel Statler and then inspect the Research Laboratory to see this new facility and the other projects that are under way.

Concrete Code Restricts Panel Heating

Society members engaged in panel heating activities have an opportunity to contribute to a study now being made toward the revision of the American Concrete Institute's Code which prohibits installation of piping or tubing in the *structural concrete* of reinforced concrete buildings.

The results of a survey on panel installations of the type covered by the ACI Code will provide valuable information for the proposed discussions between the TAC on Panel Heating and Cooling and an ACI Sub-committee on Building Regulations, to be held soon.

Thus far, members who received the accompanying questionnaire by mail have supplied a variety of suggestions based on their experience in panel heating design and application.

The clause that restricts panel heating installations in reinforced concrete buildings is to be found in Chapter 5, Section 503 of the 1951 ACI Standard Building Code and reads as follows: *Pipes which will contain liquid, gas, or vapor at other than room temperature shall not be embedded in concrete necessary for structural stability or fire protection.*

The following note also is included: *Since this section was written, a number of concrete floors have been built with pipes embedded for radiant heating which is prohibited by this section. The Committee (ACI) is studying the problem for the purpose of revising the requirements to permit the safe use of such pipes in structural concrete.*

By definition, *structural concrete* includes concrete floors, beams, columns, and walls acting as building members or sections, formed by combining concrete aggregate with steel shapes, bars or wire enforcement to accommodate a prescribed loading. *Fill on floors and slabs on grade are not classed as structural concrete.*

For many years panel heating pipes have been installed in and out of structural concrete both in this country and in foreign countries. The majority of existing installations in this country involve piping in slabs on grade, in fill, or in hung ceilings, etc., and these are not classed as being in structural concrete.

In those instances where installations have been made in *structural concrete*, special approval by local building departments or similar agencies has been required and, in some cases, such permission has been difficult to obtain.

Questionnaire

Information is requested concerning installations involving embedded piping or tubing in *structural concrete only.*

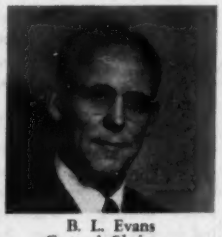
1. Location of Building .....
2. Date of Installation .....
3. Type of concrete aggregate used .....
4. Type of building construction:
   Such as flat slab, beam and slab, etc. .....
5. Type of approval:
   (a) By local building department under special permit .....
   (b) Or did local code permit such installation? .....
6. Location of heating piping with respect to the reinforcement, such as:
   (a) Above reinforcement .....
   (b) Below reinforcement .....
   (c) What clearance between piping and reinforcing steel? .....
   (d) What arrangement, — piping parallel or at right angles to main reinforcing steel? .....
   (Sketch will be of assistance.)
7. Has any recent inspection been made of the installation?
   If so, what report is available as to the present status or situation of the concrete or piping system? .....
   .....
8. Additional Comments: .....
   .....
   .....
   .....

Name .....
Address .....
City and State .....

Mail to:

Executive Secretary
THE AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS
51 Madison Ave., New York 10, N.Y.

L. L. Hamig
Chapter President

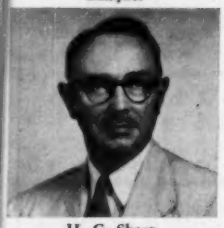


B. L. Evans
General Chairman

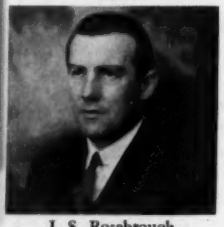
G. W. F. Myers
Vice Chairman

W. J. Oonk
Committee Secretary

E. E. Carlson
Banquet



H. C. Sharp
Ladies



J. S. Rosebrough
Entertainment

ST. LOUIS — 1952

58th ANNUAL MEETING

Committee on Arrangements

B. L. Evans, ***General Chairman***
G. W. F. Myers, ***Vice Chairman***
W. J. Oonk, ***Secretary***

Committee Chairmen

Banquet — E. E. Carlson
Entertainment — J. S. Rosebrough
Finance — W. A. Klein
Ladies — H. C. Sharp
Luncheon — J. W. Cooper
Publicity — C. H. Burnap
Reception — J. H. Carter
Sessions — C. E. Hartwein
Special Events — J. F. Naylor, Jr.
Transportation — G. H. Bemarkt

•

St. Louis Chapter President — L. L. Hamig

J. H. Carter
Reception

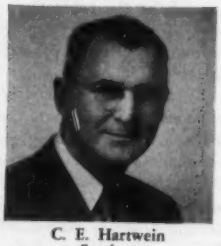
J. W. Cooper
Luncheon

J. F. Naylor, Jr.
Special Events

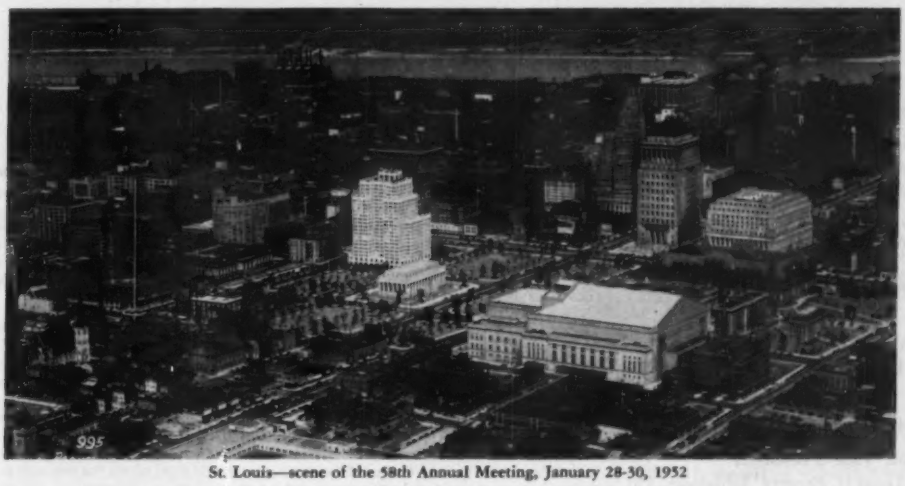
W. A. Klein
Finance

G. H. Bemarkt
Transportation

C. H. Burnap
Publicity



C. E. Hartwein
Sessions



St. Louis—scene of the 58th Annual Meeting, January 28-30, 1952

St. Louis Planning 58th Annual Meeting Program

The program for the Society's 58th Annual Meeting in St. Louis, January 28-30, 1951, is rapidly nearing completion, Bruce L. Evans, chairman of the Committee on Arrangements, announced recently in urging all members to attend.

The program is being planned to have a wide appeal to all. There will be five sessions for technical papers and discussions, as well as a full calendar of social events, thus enabling members to renew old friendships, to make new ones, and to enjoy some of that inimitable hospitality for which the Mound City is famous.

A welcome luncheon will open the meeting on Monday, January 28, and the first technical session will follow at 2:00 p.m. There will be two technical sessions on Tuesday, January 29, and two on Wednesday, January 30. The meeting will reach its climax on Wednesday evening when members and their families and guests gather for the traditional banquet.

To avoid conflict with technical sessions, Monday morning, January 28, and Tuesday evening, January 29, have been reserved for committee meetings. The Council and Executive Committees will meet on Saturday and Sunday, January 26 and 27.

St. Louis offers visitors much to see in its beautiful buildings, broad boulevards, fine churches, handsome schools, impressive universities, lovely parks, docks and levees of the Mississippi, mammoth bridges, and many historical buildings.

A tour of the city will reveal the famed statue of St. Louis, which marks the landing place of its founder, as well as the old cathedral, courthouse, slave market, and old rock house, all recalling the city's interesting history.

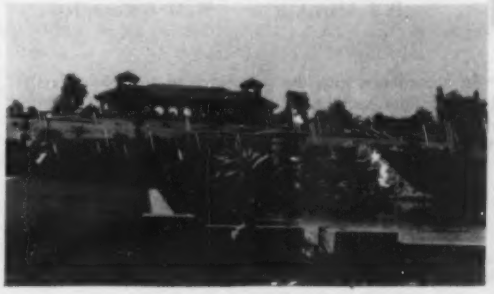
In newer St. Louis can be found the Soldier's Memorial Place, the Civic Auditorium, the Federal Building, the Jefferson Memorial, which houses the Lindbergh Trophy Exhibit, the museum, the Municipal Theater, and the Zoological Gardens. Among other points of interest, members will also be able to see Forest Park, Shaw's Gardens, Washington University, and St. Louis University, to mention only a few.

Members will find that St. Louis, *surrounded by the United States*, is easily accessible from any point on the compass. No matter where the member may live in the U.S., he can reach the Mound City by plane, train, car, or bus in a comparatively short time.

Early in August, members received a special hotel reservation form. To assure first choice reservations, they are urged to return this form as quickly as possible to: Hotel Convention Reservation Bureau, ASHVE, Room 406, 911 Locust St., St. Louis 1, Mo.

Members of the Committee on Arrangements of the St. Louis Chapter are working to make the 58th Annual Meeting *the biggest and best yet!*

Terraced Gardens—Forest Park, St. Louis



NOMINATIONS FOR 1952

Officers and Council

The Nominating Committee, selected in accordance with the provisions of **Article VIII** — *Section 3* of the By-Laws, has submitted the following nominees for Officers and members of Council for 1952:

President
ERNEST SZEKELY, Milwaukee, Wis.

First Vice President
REG F. TAYLOR, Houston, Tex.

Second Vice President
LOUIS N. HUNTER, Johnstown, Pa.

Treasurer
J. DONALD KROEKER, Portland, Ore.

Members of Council
Three-Year Term

RAYMOND T. KERN, Fitchburg, Mass.
D. M. MILLS, Houston, Tex.
PETER B. GORDON, New York, N.Y.
M. K. FAHNESTOCK, Urbana, Ill.

Respectfully submitted,

NOMINATING COMMITTEE
A. J. Hess, *Chairman*
B. L. Evans, *Secretary*

P. R. Achenbach
F. W. Chambers
I. W. Cotton
C. B. Gamble
Leo Garneau
D. M. Hummel
E. H. Langdon
A. E. Stacey, Jr.
G. L. Tuve

Alternates
P. J. Marschall
W. M. Wallace, II

In accordance with the provisions of the Society's By-Laws, ballots containing the names of the above candidates will be sent to the membership prior to the Annual Meeting in January.

Article VIII

Section 4. Other Nominations. Nominations of officers and members of the Council, other than those nominated by the Nominating Committee, and nominations of members of the Committee on Research, other than those nominated by the Council, may be made in writing by at least fifty (50) members eligible to vote, upon presentation of such nominations, with each nominee's consent, to the Executive Secretary at least sixty (60) days prior to the opening of the first session of the Annual Meeting, whereupon the nominees' names shall be placed upon the ballot with a notation that they are presented by members independent of the Nominating Committee.

Section 5. Voting. Voting at any meeting may be in person or by proxy, but only the Executive Secretary and MEMBERS of the Society shall be eligible to act as proxies. Proxies shall not be valid for more than three (3) months from dates of execution. The Executive Secretary and the MEMBERS acting as proxies shall hold the ballots of their principals secret and confidential. Voting for election of officers, Council members, members of the Committee on Research, on proposals to amend these By-Laws, and on questions required to be referred to the Society pursuant to **Article V,** *Section 2,* shall be by secret ballot. In the event of any tie vote, the Council shall decide the vote.

Section 6. Ballots. Together with notice of the Annual Meeting, the Executive Secretary shall forward appropriate proxies and ballots to members entitled to vote. The proxies and ballots shall contain spaces for write-in names.

Members of Committee on Research

The election of the Committee on Research is governed by the By-Laws for the election of Officers, with the exception that members of the Committee on Research are nominated by the Council.

In accordance with the provisions of **Article VII** — *Section 3* (*h*) the Council announces the nomination of the following members of the Committee for election to succeed those members whose present terms expire January 1952.

Committee on Research
Three-Year Term

IRWIN W. COTTON, Indianapolis, Ind.
WALTER A. GRANT, Syracuse, N. Y.
NEIL B. HUTCHEON, Saskatchewan, Canada
BURGESS H. JENNINGS, Evanston, Ill.
CHARLES O. MACKEY, Ithaca, N. Y.

Article VII

Section 3. General Committees. (*h*) *Committee on Research,* consisting of fifteen (15) MEMBERS, nominated by the Council or as provided in Article VIII, *Section 4,* and elected by the Society in the manner of elected officers.....

NOMINEES FOR 1952 OFFICERS

For President

Ernest Szekely, president, Bayley Blower Co., Milwaukee, Wis., is nominee for the office of President.

Born July 24, 1888, and graduated from the University of Budapest in

Ernest Szekely
Milwaukee, Wis.

1910 with an M.E. degree, Mr. Szekely began his engineering career as assistant and later associate professor at the University.

After coming to the United States, he worked successively as a designer for Guarantee Construction Co., N.Y.; as a research engineer for American Blower Co.; as a consulting mechanical engineer; as chief engineer for Drying Systems, Chicago; and as chief engineer for Bayley Blower. From this post, he rose in 1932 to become president of Bayley Blower.

Mr. Szekely, who joined the Society in 1920, has been extremely active in both the Northern Ohio and Wisconsin Chapters, as well as in Society activities. He has served as a member of the Council, 1945-47, and on many Society Committees, including the Nominating Committee and the Code Committee for Exhaust Systems. In 1949, he was an ex-officio member of the Executive and Finance Committees of the Council and in 1950 was chairman of the Finance Committee. He is currently serving as First Vice President and as chairman of both the Executive and F. Paul Anderson Committees.

In addition, Mr. Szekely has served on many Technical Advisory Committees, including the TAC on Infiltration in Buildings; the TAC on Effect of Entering Temperature and Velocity on the Temperature and Distribution of Air Within an Enclosure, serving as chairman in 1936; and the TAC on Air Distribution, 1937 to 1950, serving as chairman in 1937.

Mr. Szekely served the Northern Ohio Chapter as vice president in 1923 and president in 1924, and the Wisconsin Chapter as second vice president in 1933, first vice president in 1934, and president in 1935. From 1936 to 1938 he was a member of the board of governors of the Wisconsin Chapter and also has served on many code and other committees for the group.

Mr. Szekely has published numerous engineering articles and is listed in *Who's Who in Engineering*. He is a member of the *American Society of Mechanical Engineers*, *The Wisconsin Society of Professional Engineers*, the *Astronomical Society*, the Rotary Club and Tau Beta Pi and Pi Tau Sigma.

For First Vice President

Reg F. Taylor, consulting engineer, Houston, Tex., is a nominee for the office of First Vice President.

Mr. Taylor was born in Toronto, Canada, and educated in public and preparatory schools in England and Pietermaritzburg, Natal, South Africa, where he served an engineering apprenticeship with an architectural-engineering firm.

Mr. Taylor entered the United States from Canada in 1908 and for a time was engaged in the design of heating and ventilating projects in the Texas territory. He later was associated with architectural firms in Texas and Kansas City as a mechanical-electrical engineer, and was engaged in this work until the outbreak of World War I, when he served as a member of the 110th Engineers, 35th Division (Kansas-Missouri), with one year's overseas duty.

Upon his discharge from the Army, Mr. Taylor entered private practice as consulting engineer in Dallas, Tex., maintaining this office until 1938, when he transferred it to Houston, Tex., and began practice there.

He has specialized in heating, ventilating, air conditioning, and electrical design for various types of buildings, including federal housing projects, hospitals, schools, theaters, and industrial plants, principally in Texas, Louisiana, Oklahoma, Arkansas, Alabama, Arizona, and Missouri.

Reg F. Taylor
Houston, Tex.

Mr. Taylor joined the Society in 1915 and is one of the Charter members of the Kansas City Chapter. He was located in Dallas when the Texas Chapter was first organized in 1937 and served as its President. When the Texas Chapter was divided into the North Texas and South Texas Chapters, he served as president of the South Texas Chapter in 1939. He also served as a member of its Board of Governors in 1940, 1943, and 1944 and on numerous Chapter Committees.

Mr. Taylor was elected a member of the Society's Council for a three-year term, 1947-49, and currently is serving as Second Vice President of the Society. Among Society positions in which he has served are:

Chairman, Special Committee on Chapter Relations, 1947; Chairman, Membership Committee, 1948; Chairman, Program and Papers Committee, 1949; Executive Committee, Ex Officio, 1950; Finance Committee, Ex Officio, 1950; Member, Executive Committee, 1951; Chairman, Finance Committee, 1951; Ways and Means Committee, 1951.

Mr. Taylor is a registered professional engineer in the State of Texas and a member of the *Texas Society of Professional Engineers*, the *American Institute of Electrical Engineers*, the Rotary Club of Houston, Houston Engineers Club, and Houston Electric Club.

For Second Vice President

L. N. Hunter, vice president of research, The National Radiator Co., Johnstown, Pa., is the nominee for the office of Second Vice President.

He was born August 27, 1903, in Brampton, Ontario, Canada, where

L. N. Hunter
Johnstown, Pa.

he received his preliminary education and attended the University of Toronto, receiving his degree of B.A.Sc. in 1925.

Mr. Hunter began his career with the Bryant Heater Co., Cleveland, Ohio, as assistant research engineer. He served in this position for four years and then joined the staff of The National Radiator Co. as gas engineer, assigned to the design and testing of gas-fired home heating boilers and controls, and also to the design and testing of special cast-iron, gas-fired boilers for treating crude oil emulsions.

In 1932, he was made assistant manager of the firm's research department, where he supervised the design, test and research work on coal, oil and gas-fired boilers, oil burners, stokers, radiators, convectors and air conditioning equipment, and accessories and controls.

In 1935, Mr. Hunter was promoted to manager of the Research Department and in 1941 was appointed vice president and manager of research. Since 1943, he has served on the Board of Directors.

Mr. Hunter joined the Society in 1935 and served on Technical Advisory Committees on Radiation and Comfort, and on the Solid Fuels Committee from 1939 to 1942. In 1948 and 1949, he served as chairman of the Society's Committee on Research; also as a member of its Executive Committee in 1946 and 1947; as chairman of its Executive Committee in 1948-49 and as a member of the Committee in 1950.

Mr. Hunter served on the TAC on Fuels, 1947; the TAC on Panel Heating and Cooling, 1948, 1950, and 1951; TAC on Combustion, 1950; TAC on Hot Water and Steam Heating, 1950-51; and Standards Committee, 1951. He was elected to Council in 1951.

Mr. Hunter also is a member of the *American Society of Mechanical Engineers* and is serving on its Heating Boiler Code Committee; *American Chemical Society; American Gas Association; Air Pollution and Smoke Prevention Association of America; American Ordnance Association;* the Sunnehanna Country Club; and the Bachelors Club.

In addition, he has served on committees of the *Institute of Boiler and Radiator Manufacturers;* the *Steel Boiler Institute;* and the *Oil Heat Institute of America.*

For Treasurer

J. Donald Kroeker, consulting engineer, Portland, Ore., is nominee for the office of Treasurer.

Born April 4, 1900, in Russia, he attended high schools in Saskatchewan, Canada, and Dallas, Ore., and received his B.S. in civil engineering from the Oregon State College in 1927, and his M.E. in 1937.

After graduation, Mr. Kroeker joined the staff of the AGA Testing Laboratory, Cleveland, Ohio, where he was assigned to research and testing of gas heating appliances. In 1930, he became affiliated with the Pennsylvania Furnace and Iron Co., Warren, Pa., as development engi-

J. Donald Kroeker
Portland, Ore.

neer, and remained with this firm until 1935, when he joined the Klamath Machine & Locomotive Works, Klamath Falls, Ore. In 1938, he established his present consulting engineering practice, specializing in heating, ventilating, air conditioning and power plant engineering.

During the last war, he served as a Captain and later as a Lt. Colonel with the Corps of Engineers, U.S. Army, stationed in Alaska.

Mr. Kroeker joined the Society in 1936, and is now serving as a member of Council. Other Society positions in which he has served include: Membership Committee, 1951; Standards Committee, Chairman, 1950; Nominating Committee, 1941, 1942 and 1946; Chapter Relations Committee, 1948; TAC on Weather Design, 1945; TAC on Heat Pump, 1950-51; and the F. Paul Anderson Award Committee. An active member of the Oregon Chapter, he served as its first president in 1939, on the Board of Governors from 1940 to 1943 and on numerous committees.

He has published various articles in technical journals and presented the following papers to the Society: *Summer Weather Design* (in 1941), *A Heat Pump in an Office Building* (in 1948), *Heat Pump Results in the Equitable Building* (in 1949), and *Heat Pump Application to a Newspaper Plant* (1951).

NOMINEES FOR 1952 MEMBERS OF COUNCIL

Three-Year Term

M. K. Fahnestock, research professor and coordinator of research, Department of Mechanical Engineering, Engineering Experiment Station, University of Illinois, Urbana, Ill., is a nominee for a three-year term on the Council.

Born April 7, 1900, in Wanda, Illinois, Professor Fahnestock was graduated from the University of Illinois in 1924 with a B.S. degree in mechanical engineering and six years later received an M.S. degree in mechanical engineering from the same University.

Considered one of the leading research figures in the heating, ventilating, and air conditioning field today, he began his career in 1924 with the Shell Petroleum Corp., Roxana, Ill., as a mechanical engineer in construction and maintenance.

He joined the staff of the College of Engineering at the University of Illinois in 1926, and his first assignment was on steam and water heating research. In 1935, he was transferred to the University's Engineering Experiment Station, where he was assigned to liaison work between the University's Colleges of Medicine, Agriculture and Engineering in the development of research in heating, ventilating and air conditioning in relation to human health and comfort. He was named special assistant research professor in 1932 and research professor and assistant director of the Engineering Experiment Station in 1942. In 1949 he was appointed Engineering Director of the Physical Environment Unit.

During his early years at the University, under Professors A. C. Willard and A. P. Kratz, Professor Fahnestock figured importantly in the development, erection, and operation of the refrigerated room type of heating and testing plant in the school's Mechanical Engineering Laboratory, as well as the warm wall test booth which provides an economical method of testing and rating radiators, convectors, and baseboard radiation. In recent years, he has had an important part in the development of the University's programs to determine the effect of atmospheric environment on human beings and animals, aviation activities and housing research.

Professor Fahnestock has been extremely active in the Society through the years. Positions he has held include: Committee on Research, 1938-43 and 1947-50; Executive Committee, 1940-43; Chairman, TAC on Refrigeration in Relation to Air

M. K. Fahnestock
Urbana, Ill.

Treatment, 1935-36; Chairman, TAC on Direct and Indirect Radiation with Gravity Air Circulation, 1935-36; TAC on Effect of Entering Temperature and Velocity on Temperature and Distribution of Air Within an Enclosure, 1936; Chairman, TAC on Radiation with Gravity Circulation, 1937-43; Member, TAC on Air Distribution and Air Friction, 1938-39 and 1943; Chairman, TAC on Summer Air Conditioning for Residences, 1937-43; Member, TAC on Instruments, 1939-40; TAC on Sensations of Comfort, 1945-46 and 1950-51; and Chairman, TAC on Physiological Research, 1950-51.

Professor Fahnestock has written numerous papers for presentation before the Society as well as many articles for inclusion in various technical publications and in the Engineering Experiment Station Bulletin. He is also a member of the *American Society of Refrigerating Engineers* and the *American Society for Engineering Education.*

Peter B. Gordon, vice president, Wolff & Munier, Inc., New York, N.Y., is a nominee for a three-year term on the Council.

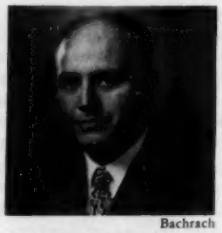
Born August 15, 1907, in Montclair, N.J., Mr. Gordon was graduated in 1928 from Rutgers University with a B.S. in civil engineering. During the summers of 1925-1928 he worked as a draftsman-estimator on heating and ventilating installations with the Raisler Corp., New York, N.Y., and during the year following graduation was with the Tarkow Co., New Brunswick, N.J., where he handled drafting, estimating and supervisory work on heating and ventilating installations. In 1929, he joined the George E. Gibson Co., New York City, where his first assignment was on estimating, purchasing, and general work related to heating, ventilating, air conditioning, and power plant applications. In 1932, he was appointed engineer in charge of the heating and ventilating department for the George E. Gibson Co., and served in that position until 1936 when he left to become connected with Wolff & Munier, Inc., as engineer for heating, ventilating, and air conditioning work. He was named treasurer in 1939, director in 1940, and was appointed to his present position as vice president on January 1, 1951.

In addition, Mr. Gordon has served in an advisory capacity on special air handling and air conditioning problems for several installations of the Atomic Energy Commission, including the Brookhaven National Laboratory on Long Island and the Argonne National Laboratory (the University of Chicago). From 1943 to 1946, he was on loan from Wolff & Munier, Inc., to the Kellex Corp., to assist on engineering problems involved in the design and construction of the K-25 Gaseous Diffusion Project at Oak Ridge, Tenn.

Mr. Gordon also has had wide experience as a teacher of heating, ventilating, and air conditioning. From 1937 to 1942, he was an instructor in the evening division of New York University, giving courses in heating, ventilating, and air conditioning to undergraduate mechanical engineers. Since 1946, he has

been an adjunct associate professor at New York University, giving an air conditioning course in the Graduate Division. Between 1946 and 1949, he also was visiting lecturer in mechanical engineering at Princeton University, giving a course in air conditioning.

Mr. Gordon, who joined the Society in 1934, has been extremely active in ASHVE work. Among the Society positions in which he has served are: Guide Publication Committee, 1949-51, serving as its chairman in 1951; Chairman, TAC on Panel Heating and Cooling, Group A, 1949; and TAC on Panel Heating and Cooling, 1947-51, serving as its chairman in 1949-51. He is a member of the New York Chapter, has been on its Board of Governors since 1947, and is its Vice President this year. In addition, Mr. Gordon has served on several committees of the *Heating, Piping and Air Conditioning Contractors National Association*, including the Committees on Standards, Research, and Home Heating, and also as Chairman of the Committee on Radiant Panel Heating.



Bachrach

P. B. Gordon
New York, N. Y.

Mr. Gordon is a member of the *American Society of Mechanical Engineers, American Society of Refrigerating Engineers, American Society for Engineering Education*, and the Chemist's Club of New York.

Raymond T. Kern, chief engineer, the Jennison Co., Fitchburg, Mass., is a nominee for a three-year term on the Council.

Mr. Kern was born May 30, 1884 in Reading, Pa., and began his business career in 1909 with the Almirall Co., New York, N. Y., as a draftsman. In 1912, he left to join McMullen, Riley, and Durley, Montreal, Canada, as an engineer and served in that position until 1914, when he became connected with the Jennison Co. as chief engineer. He has been with the firm ever since.

R. T. Kern
Fitchburg, Mass.

Mr. Kern has been extremely active in the Massachusetts Chapter, serving as President in 1949; Secretary-Treasurer, 1942, 1947, and 1948; Member, Board of Governors, 1931, 1941, 1943, and 1947-49. He served as chairman of the Society's Nominating Committee, 1950; Massachusetts Chapter Representative on the Nominating Committee, 1949; Alternate, on the Nominating Committee, 1944; Chapter Delegate for the Massachusetts Chapter, 1943, 1949-50; Chapter Alternate for the Massachusetts Chapter, 1948.

Mr. Kern is author of the paper, *Forced Circulation of Hot Water Heating*, which was published in the Society's JOURNAL. He has also written papers on the same subject for presentation in other trade and technical publications and at engineering group meetings, including the Massachusetts Chapter. In addition, he is co-author of the chapter, *Piping Design for Forced Hot Water Systems*, in the text, *Heating, Ventilating, Air Conditioning Fundamentals*, by W. H. Severns, and has contributed to several editions of THE GUIDE.

Mr. Kern is a member of the *National Society of Professional Engineers* and is a registered professional engineer in the State of Massachusetts. He is a York Rite Mason and a Shriner.

D. M. Mills, manager, F. J. Evans Engineering Co., Houston, Tex., is a nominee for a three-year term on the Council.

Born September 27, 1908, in Hanover, Ind., Mr. Mills was graduated from Purdue University in 1933 with a B.S. degree in chemical engineering. He began his business career that same year with the Autogas Corp., Chicago, Ill., as a sales and service engineer for conversion burners, remaining with that firm until 1934 when he left to join the Surface Combustion Corp., Toledo, Ohio, as sales engineer for space heating.

D. M. Mills
Houston, Tex.

He remained with them until 1938 and then spent one year with Dominion Refrigeration, their distributor in Ontario at Toronto. He became associated with the F. J. Evans Engineering Co. in June of 1939 in Birmingham, Ala., as sales engineer for space heating, serving in that position until October of 1939 when he was appointed manager of the Houston office, his present post.

A member of the Southwest Texas Chapter, Mr. Mills served as Secretary in 1945, Vice President in 1946, and President in 1947. Society positions which he has held include: Chapter Delegate, 1946; Nominating Committee, 1946 and 1949, and serving as Secretary in 1950; TAC on Panel Heating and Cooling, Group A, 1951; Chapter Relations Committee, 1951.

He is a member of the *Houston Engineers Club*, Blue Flame Council of Houston, the *Southern Gas Association*, Houston Rotary Club, and the Houston Chamber of Commerce.

NOMINEES FOR 1952 COMMITTEE ON RESEARCH

Three-Year Term

Irwin W. Cotton, president, I. W. Cotton Co., Inc., Indianapolis, Ind., is a nominee for a three-year term on the Committee on Research.

Born September 23, 1887, at Greensboro, Ind., he attended Butler

I. W. Cotton
Indianapolis, Ind.

University and in 1908 received B.S. degrees from J. B. Stetson University and from the University of Chicago.

After four years as a bank bookkeeper, Mr. Cotton entered the heating contracting field in Greenfield, Ind., and engaged in this activity until the outbreak of World War I. During the war, he was an engineering officer in the United States Naval Reserve and served on both the USS Pequot and USS Mongolia. Shortly after release from active duty, he re-entered the heating contracting field in Indianapolis, continuing that activity until 1928, when he organized the I. W. Cotton Co., Inc., of which he is principal owner and manager. In 1942, Mr. Cotton took a one year leave of absence from the company to serve as district fuel rationing officer, Indianapolis District, Office of Price Administration. In 1948 he served on the Indianapolis Anti-Air Pollution Board.

Since becoming a member of the Society in 1943, he has been extremely active in the Indiana Chapter, serving as Vice President in 1946, as President in 1947, as chapter delegate, 1946-49, and as a member of the Board of Governors, 1945-46 and 1948-49. He is currently serving on the Nominating Committee and as chairman of the Society's Committee on Research.

Mr. Cotton is a member of the Indianapolis Air Conditioning Council, Indianapolis Chamber of Commerce, Construction League of Indianapolis, Indianapolis Sales Executives Club, and the Service Club of Indianapolis. He has also authored a number of papers and articles on heating, ventilation, and air conditioning.

Walter A. Grant, director of research, Carrier Corp., Syracuse, N.Y., is a nominee for a three-year term on the Committee on Research.

W. A. Grant
Syracuse, N. Y.

Mr. Grant was born August 27, 1904, in Brooklyn, N.Y., and is a graduate of Columbia University, New York City, where he received his A.B., B.S., and M.E. degrees.

He joined the Carrier Engineering Corp. in 1928 as a junior engineer, specializing in air conditioning. Subsequently, he served the Carrier Corp. as an application engineer, development engineer, Eastern Regional chief engineer and director of application engineering. He was named to his present position as director of research in 1947.

Society positions in which he has served include: Committee on Research, 1949-51; TAC on Odors, 1949-51; and the TAC on Sensations of Comfort, 1949-51.

Mr. Grant is co-author (with W. H. Carrier and R. E. Cherne) of the text book, *Modern Air Conditioning, Heating, and Ventilating,* and also has written numerous technical papers in the field. In addition, he has contributed to THE GUIDE and is associate editor of the *ASRE* Data Book.

Mr. Grant is a member of the *American Society of Refrigerating Engineers, American Association for the Advancement of Science,* Phi Gamma Delta, Tau Beta Pi, and Sigma Xi fraternities. He is a licensed professional engineer in New York and New Jersey.

Neil B. Hutcheon, professor of mechanical engineering, University of Saskatchewan, Saskatoon, Canada, is a nominee for a three-year term on the Committee on Research.

Born March 13, 1911 in Rosetown, Saskatchewan, Canada, Professor Hutcheon was graduated from the University of Saskatchewan in 1933 with a B.E. degree in engineering and two years later received a Master of Science degree in engineering from the same University. He then continued his education for two years

N. B. Hutcheon
Saskatchewan, Canada

at the University of London, where he was awarded a Ph.D. in engineering.

Professor Hutcheon began his career in 1937 when he returned to the University of Saskatchewan as assistant professor, teaching machine design and heating and ventilation. He served in that capacity until 1942,

when he became professor at the University, and since 1947 has been engaged in research in heat and moisture in walls, in addition to teaching. From 1945 to the present, he has been engaged as a consultant in the design of a number of heating and ventilating systems, and since 1949 has served as technical consultant to the Prairie Regional Station of the Division of Building Research, National Research Council, which is located on the University campus. Professor Hutcheon is at present on a year's leave of absence from the University of Saskatchewan, which he is spending in Ottawa as a member of the staff of the Division of Building Research.

Professor Hutcheon is a member of the Ontario Chapter and is currently serving on the TAC on Insulation. He is a registered professional engineer in Saskatchewan and also holds membership in the *Engineering Institute of Canada.*

Burgess H. Jennings, professor of mechanical engineering and department chairman, Northwestern University, Evanston, Ill., is a nominee for a three-year term on the Committee on Research.

Burgess H. Jennings
Evanston, Ill.

Professor Jennings was born September 12, 1903 in Baltimore, Md., and, upon graduation from Johns Hopkins University in 1925 with a B.E. degree in mechanical engineering, he worked for about one year with the Consolidated Gas, Electric Light and Power Co., Baltimore, Md., as cadet engineer. He then joined the faculty in mechanical engineering at Lehigh University, Lehigh, Pa., where he served for 14 years and also earned an M.S. degree in mechanical engineering and an M.A. degree in mathematics. During eight of his years at Lehigh, he was in complete charge of the University's mechanical engineering laboratories, both teaching and conducting research.

In the period from 1934 to 1938, Professor Jennings was a consultant for the Philadelphia and Reading Coal and Iron Co., Pottsville, Pa., and, from 1943 to 1945, performed the same function for the Frigidaire Division of the General Motors Corp. In addition, he has served as research investigator on control of cross-infection in military units for the U.S. Office of Scientific Research and Development and also has been engaged since 1930 in general research and writing relative to refrigeration, air conditioning, and power production. He was appointed to his present post as professor of mechanical engineering at Northwestern in 1940. In November, 1950, he was the recipient of the annual Richards Memorial Award for outstanding achievement in mechanical engineering.

Books written by Professor Jennings include: *Steam and Gas Engineering* (with T. E. Butterfield and A. W. Luce) in 1933 and 1947; *Air Conditioning and Refrigeration* (with S. R. Lewis) in 1938 and 1949; *Internal Combustion Engines, Analysis and Practice* (with E. F. Obert) in 1944; and *Handbook of Toxic Gases* (with J. F. Bailey) in 1945.

Professor Jennings is a member of the *American Society of Mechanical Engineers,* the *American Society of Refrigerating Engineers, American Public Health Association, Society for the Promotion of Engineering Education;* and of Pi Tau Sigma, Tau Beta Pi, Sigma Xi, and Pi Mu Epsilon, and of the University Club of Evanston.

Society positions in which Professor Jennings has served include the Guide Publication Committee, 1947-48 and 1950-51; TAC on Air Sterilization and Odor Control, 1945-46; and TAC on Air Sterilization, 1947-49.

Charles O. Mackey, professor of heat-power engineering, Cornell University, Ithaca, N.Y., is a nominee for a three-year term on the Committee on Research.

He was born in Ithaca, October 8, 1903, and received his M.E. in 1926

C. O. Mackey
Ithaca, N. Y.

from Cornell University. The following year he was engaged as an instructor in experimental engineering at the University, and subsequently he became instructor in heat-power engineering, assistant professor, and full professor in heat-power engineering. He is in charge of the Mechanical Engineering Laboratory at the University.

Professor Mackey, who joined the Society in 1942, previously has served as a Member of the Committee on Research, 1946-49. He also has served on a number of Technical Advisory Committees, including the TAC on Heat Flow Through Glass, 1948; TAC on Cooling Load, 1946-51; TAC on Panel Heating and Cooling, 1948-50; and TAC on Cooling Load in Summer, 1943.

Professor Mackey has presented many papers before the Society and is the author of several books, including *Graphical Solutions, Thermodynamic Charts* and *Air Conditioning Principles.* In addition he is co-author of many articles which have appeared in various technical publications.

He is a member of the *American Society of Refrigerating Engineers* and the *Society for the Promotion of Engineering Education.* Professor Mackey is listed in *Who's Who in Engineering.*

Summary of Chapter Meetings*

• *NORTH TEXAS*—August 20, 1951. Pres. R. G. Lyford called the meeting to order in the Melrose Hotel and the minutes of the May and July meetings were read and approved. After members and guests introduced themselves, L. S. Gilbert, program chairman, introduced the speaker, K. P. Kuhlman, General Electric Co.

Mr. Kuhlman discussed the various types of motors commonly used in air conditioning and related building operation, their relative starting and running current and torque characteristics, and the starting equipment available to serve them. He presented some interesting test figures reflecting the effect of unbalanced line voltages on current distribution in the windings of a three phase motor and the operating difficulties that might result. Mr. Kuhlman's talk was well received and an interesting discussion period was conducted. The meeting adjourned at 9:45 p.m. Attendance 66. Attendance ratio 0.40.

• *NORTH TEXAS*—July 16, 1951. Pres. R. G. Lyford called the meeting to order at 8:15 p.m. in the Melrose Hotel, and members and guests introduced themselves. George McBlair, industrial analyst for the National Production Authority, Department of Commerce, Dallas, Tex., was the speaker of the evening. Mr. McBlair explained the workings of the Controlled Materials Plan, covering the many orders and regulations which implement it. At the conclusion of the talk, members and guests questioned Mr. McBlair on specific applications of these rules to situations which they were encountering.

C. Rollins Gardner reported that he had extended an informal invitation to the Council to hold its October meeting in Dallas. In view of the apparent approval and support of the Chapter, President Lyford authorized the secretary to extend a formal invitation. The meeting adjourned at 9:45 p.m. Attendance 66. Attendance ratio 0.44.

• *NORTHEASTERN OKLAHOMA*—August 14, 1951. Members and guests met at Smith's Restaurant at 6:30 p.m. for a dinner meeting, and the business meeting was called to order by Pres. R. F. Shoemaker at 8:00 p.m. The roll was called and the minutes of the previous meeting were read and approved.

The speaker of the evening was R. J. deFassalle, field engineer, Bryant Heater Div., Affiliated Gas Equipment, Inc., Cleveland, Ohio. Mr. deFassalle gave an interesting discussion on *Heating and Air Conditioning Residences*, which he illustrated with slides. The talk was followed by a question and answer period. The meeting adjourned at 10:00 p.m. Attendance 36. Attendance ratio 0.58.

• *ST. LOUIS*—May 15, 1951. The meeting was called to order at 7:30 p.m. in Town Hall by Pres. J. S. Rosebrough, and the minutes of the previous meeting were read and approved. Reports were given by the following: C. H. Burnap—program committee; E. E. Carlson—arrangements for the dinner-dance; G. H. Bemarkt—auditing committee; J. B. Killebrew—membership committee; and B. L. Evans—St. Louis Annual Meeting Committee on Arrangements.

The election of officers was held with the following results: *president*—L. L. Hamig; *first vice president*—C. H. Burnap; *second vice president*—H. C. Sharp; *secretary*—J. F. Naylor, Jr.; *treasurer*—G. H. Bemarkt; *board of governors*—F. E. Ince, J. B. Killebrew, J. S. Rosebrough, and H. F. Wilson.

The meeting was concluded with the showing of a film titled, *Hints on Electrical Servicing in the Air Conditioning Industry*, by W. C. Swinghamer and D. M. Allison, both of the Westinghouse Corp. The meeting was adjourned at 9:15 p.m. Attendance 53.

• *SOUTHWEST TEXAS*—July 17, 1951. Pres. I. W. Wilke called the meeting to order at 9:15 p.m. in the Tapestry Room of the St. Anthony Hotel. Roll call was by signature and the minutes of the previous meeting were read and approved. W. E. Long, vice president and program chairman, reported on the programs arranged for the coming Fall meetings.

Vice President Long then introduced the speaker of the evening, R. R. Krezdorn, electrical engineer, Fargo Co., Austin, Tex., who gave an interesting talk on *Water Conservation and Power Development*. Mr. Krezdorn brought out the fact that we are in the tenth year of a twelve-year drought, and should build more dams or reservoirs to preserve this water supply, reminding the audience that water conservation is closely connected with power development.

An interesting fact mentioned by the speaker was that 81 percent of our rainfall flows into the Gulf of Mexico, and that the only conservation program in this part of the country of any consequence is that of the Colorado River. Two other interesting facts that he mentioned were that 74,000,000 gallons of water per day flow into the Colorado, and that floods have caused $84,000,000 damage in the past 40 years.

Mr. Krezdorn went on to state that power generation is a valuable by-product of dams and that the instal-

*Note: The attendance ratios shown represent the membership attendance divided by the chapter membership. These ratios will be useful as a partial indication of interest shown by local chapter members in various types of subjects programmed by the various chapters and may be useful in deciding on subjects for chapter meetings.

St. Louis

"surrounded by the United States"

will be the scene

of the

58th ANNUAL MEETING

January 28-30, 1952

please mail your

Special Hotel Reservation Form — NOW!

lation of large pumps at the Buchanan Dam has increased the electric output considerably. While on the subject of power, he mentioned that the universal use of air conditioning has brought the peak load of power consumption to 2 to 5 p.m. in the warm months.

At the conclusion of his talk, Mr. Krezdorn showed some interesting color slides of the three main dams of the Lower Colorado River Authority, namely, the Buchanan, Marble Falls, and Granite Shoals dams. Attendance 24. Attendance ratio 0.31.

CLEANER AIR WEEK SET FOR OCT. 21-27

Cleaner Air Week will be observed in the United States and Canada from October 21 to 27. This announcement was made recently by Charles N. Howison, National Chairman of the Cleaner Air Week Committee of the Air Pollution and Smoke Prevention Association of America, and secretary of the Smoke Abatement League of Hamilton County, Cincinnati, Ohio, in conjunction with the United States Department of Commerce.

SHIRE OPENS NEW OFFICES

A. C. Shire, consultant on all phases of building and housing, has announced the opening of new offices in the Dupont Circle Building, Washington, D.C.

MICHIGAN M AND T REPORTS ON RESEARCH FACILITIES

A survey of research facilities and personnel at Michigan College of Mining and Technology, Houghton, Mich., was published recently. The purpose of this report is to provide a comprehensive survey of the research potential at the College for State or Federal agencies, for the armed forces, and for industrial and research organizations.

PAUL B. HOLMES IN N.P.A. POST

Paul B. Holmes, Washington, D.C., a member of the Society, has been appointed assistant director of the Building Materials Division, with supervision over plumbing and heating matters, it was announced recently by the National Production Authority, U.S. Department of Commerce.

Born in Baltimore, Md., in 1898, Mr. Holmes has been associated with The National Radiator Co., Johnstown, Pa., during most of his business career. He formerly was manager of the Washington branch, which includes the Southeastern seaboard. From 1944 to 1948 he was sales manager of the company's heating division.

From 1948 until the time of his N.P.A. appointment, he was owner of Paul B. Holmes and Co., Washington, manufacturers' agent for a number of producers of plumbing and heating supplies. His sons now manage the company.

J. J. CASEY APPOINTED BY CHRYSLER AIRTEMP

J. J. Casey, St. Louis, Mo., a member of ASHVE, has been appointed district representative for the Airtemp Division of Chrysler Corp., it was announced recently by C. S. Stackpole, vice president and general sales manager. Mr. Casey is a member of the Society's St. Louis Chapter.

JOHNS-MANVILLE APPOINTS TWO

C. A. de Vyver has been appointed manager of insulations of Johns-Manville, it was announced recently by F. J. Wakem, merchandise manager of the Industrial Products Division and vice president of Johns-Manville Sales Corp.

Mr. Wakem also announced the appointment of Duane D. Crews as manager of construction of the J-M Industrial Products Division.

DR. E. A. WALKER PENN STATE DEAN

Dr. Eric A. Walker, executive secretary of the Research and Development Board of the Department of Defense, recently was named dean of the School of Engineering at The Pennsylvania State College, it was announced by Dr. Milton S. Eisenhower, President of the College. Dr. Harry P. Hammond, who has been dean of the School since 1937, retired with emeritus rank September 1.

Born in Long Eaton, England, Dr. Walker was reared in Wrightsville, York County, Pa., and completed his undergraduate and graduate work at Harvard University. After teaching at Tufts College and the University of Connecticut, Dr. Walker joined the Harvard Underwater Sound Laboratory at Cambridge, Mass., in 1942, and became associate director in charge of the development of ordnance weapons.

In 1945, a part of the laboratory was moved to The Pennsylvania State College as the Ordnance Research Laboratory, and Dr. Walker was named director as well as professor and head of the department of electrical engineering at Penn State. He has been on leave from these positions during the past year.

E. A. Walker
Pennsylvania State College

Dr. Walker was senior author of the paper, *A Survey of Electrostatic Precipitation*, presented at the Society's 57th Annual Meeting in Philadelphia last January. J. E. Coolidge, associate professor of engineering research, Penn State, was junior author.

ILLINOIS CHAPTER IN GOLF TOURNEY

Approximately 75 members and guests of the Western Trade Golf Association, Chicago, turned out for the ASHVE day, recently. Featuring luncheon, golf, and dinner, this is an annual event to which members of the Illinois Chapter of THE AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS are invited. Held at Medinah Country Club, the affair was a notable success, with chapter members winning numerous awards. G. D. Haberer and E. W. Rietz tied for the first place ASHVE award. Guest blind bogey awards were won by J. P. Bazzoni and C. A. Gustafson. WTGA awards for Class A and B events were won by N. E. Bueter, H. Strauss, vice president of the Association, and A. B. Byfield. Mr. Bueter also won the Association's monthly cup.

1951 RESEARCH CUP TO URBAN AND BLANKIN

M. F. Blankin, Philadelphia, Pa., and F. F. Urban, Portland, Ore., became half owners of the Society's Research Cup for 1951 when they each fired 66 to deadlock for low net in the golf competition at the Semi-Annual Meeting in Portland last July.

The Eichberg Cup, awarded for low team net, was won by the Oregon unit, composed of Mr. Urban, with his 66, and J. P. McDermott and A. S. Weiant, each 67.

The Oregon Cup for low gross went to E. A. Murhard, Portland, Ore., who negotiated the beautiful Glendoveer Course in the fewest number of strokes, 79.

G. R. Folds, Jr., Portland, Ore., victim of one of *those days* that catch up with every golfer now and then, did just the opposite, requiring 127 swings to reach the clubhouse, and thus became the *winner* of the Paul Bunyan Cup for high gross. R. M. Johnson, Riverside, Calif., took the Blind Bogey Award.

Scores

Name	Gross	Hdcp	Net
J. FINKBEINER	86	14	72
W. MAXWELL	102	23	79
BRUCE EVANS	96	14	82
BOB SCHROEDER	105	23	82
W. R. BURTON	95	26	69
BUD NORTE	97	20	77
F. SCHWAN	118	30	88
A. WEIANT	84	17	67
F. URBAN	84	18	66
J. MCDERMOTT	85	18	67
T. JONES	81	11	70
R. LANKOW	88	20	68
W. G. WOOLLEY	104	30	74
BOB FOLDS	127	30	97
E. KELLY	103	30	73
TOM FRANKLIN	126	30	96
R. SELBERG	82	11	71
R. H. BROWN	—	6	—
BOB JOHNSON	87	11	76
RIDGE BAKER	89	15	74
R. CHEWNING	93	15	78
H. E. WOODWARD	93	22	71
M. LAWLER	113	30	83
W. SIMPSON	99	23	76

Name	Gross	Hdcp	Net
ED. SIEGERT	99	26	73
M. D. SKINNER	90	19	71
M. F. BLANKIN	83	17	66
LEE MILLER	107	17	90
DON BENZ	86	14	72
J. JAMIESON	94	14	80
R. U. BERRY	82	11	71
D. F. OWENS	108	27	81
AL FREEMAN	100	22	78
JACK BOWEN	101	23	78
H. F. WARREN	101	22	79
W. PHILLIPS	99	14	85
L. T. AVERY	94	25	69
NEIL PETERSON	89	19	70
NAT HUNTER	92	24	68
N. BROWN	82	14	68
JOE MURRAY	—	30	—
REG. CUSHING	—	30	—
GEO. DIETER	—	22	—
W. WARRINGTON	—	30	—
A. BOHREN	97	23	74
E. MURHARD	79	9	70
L. P. SAUNDERS	96	15	71

Candidates for Membership

The Society's By-Laws require that all applications for membership or advancement are to be sent to the Executive Secretary and the names of applicants and their references shall be printed in the next issue of the JOURNAL of the Society, or mailed to all members. When the replies are received from references, the Candidate's application shall be submitted to and acted upon by the Admission and Advancement Committee as soon as possible.

When the Admission and Advancement Committee has acted favorably upon a Candidate's application and assigned his grade, the Council shall confirm the election of the proposed Candidate for membership. During the past month, there have been 43 applications for membership, including 1 reinstatement; in addition 3 advancements have been received. The names of these men and their sponsors are published in the following list.

Members are requested to scrutinize the list with care. The Admission and Advancement Committee, and in turn, the Council, urge members to assume their share of responsibility of receiving these candidates into membership by advising the Executive Secretary promptly of any whose eligibility for membership is in any way questioned.

All correspondence in regard to such matters is strictly confidential, and is solely for the good of the Society, which it is the duty of every member to promote.

Unless objection is made by some member by October 31, 1951, these candidates will be voted upon by the Council. Those elected to membership will be notified by the Executive Secretary immediately after election.

ANDERS, G. R., Design Engr., Newport News Shipbuilding and Dry Dock Co., Newport News, Va. REFERENCES: J. R. Dickinson*, J. E. Harding, G. B. Johnson, D. E. Phillips.

ANDERS, H. C., Production Mgr., Northwest Foundry & Furnace Co., Portland, Ore. REFERENCES: R. C. Chewning, F. R. Johnson, H. W. McKenzie, W. R. Pindell.

BREIDERT, G. C., Pres., G. C. Breidert Co., Los Angeles, Calif. REFERENCES: I. W. Cotton, E. W. Gifford, H. K. Mead, N. H. Peterson.

CARSON, A. T., Owner, W. B. Carson's Son, Hartford, Conn. REFERENCES: T. L. Arnold, F. L. Hausser, Walter Heywood, J. D. Pierce.

CASSEL, I. K., Design Engr., Newport News Shipbuilding & Dry Dock Co., Newport News, Va. REFERENCES: J. E. Harding, G. B. Johnson, D. E. Phillips, C. E. Trent.

DE RIGNE, J. R., Partner, J. R. De Rigne & Associates, Kansas City, Kan. REFERENCES: D. M. Allen, W. K. Dyer, O. K. McCullough, A. J. Sneller.

DE SMET, A. C., Sales Engr., Ilg Electric Ventilating Co., Chicago, Ill. REFERENCES: B. L. Casey, J. M. Frank, Herbert Kreisman, A. G. Sutcliffe.

DICKSON, R. W., Sales Repr., United States Radiator Corp., Columbus, Ohio. REFERENCES: H. R. Allonier, A. T. English, R. B. Jackson, F. A. Shuler.

DIORIO, GINO, Design Draftsman, Wiggs, Walford, Frost & Lindsay, Montreal, Que., Canada. REFERENCES: W. B. Horswill, D. L. Lindsay, L. C. A. Walford, G. L. Wiggs.

DITTO, R. J., Design Engr., American Radiator & Standard Sanitary Corp., Yonkers, N.Y. REFERENCES: F. E. Hanson, J. C. Reed, L. L. Smith, Herwart Werker.

DUDLEY, D. L., Mech. Engr., Alaska Native Service, Juneau, Alaska. REFERENCES: M. E. Boyer*, H. B. Foss*, R. W. Mize*, H. A. Wolfson.

FRAZEE, F. B., Sales Engr., Calcasieu Lumber Company, Austin, Tex. REFERENCES: H. G. Chapin, C. D. Mericle, Ben Paller, L. S. Pawkett.

GUTZLER, W. D., Sales Engr., Minneapolis-Honeywell Regulator Co., Portland, Ore. REFERENCES: J. S. Bowen, Jr., K. H. Hanson, W. F. Kelly, Jr., F. W. McCarthy.

HAMPTON, C. F., Chief Engr., L. M. Leathers' Sons, Athens, Ga. REFERENCES: C. W. Heery*, T. B. Hinnant*, Leo Sudderth, Jr., C. L. Templin.

HAYNES, S. G., Sales Engr., Johnson-Goodyer, Inc., New Haven, Conn. REFERENCES: T. F. Houlihan, W. A. Johnson, H. E. Lucas, J. R. Murphy.

HEIDER, S. A., Staff Engr., Building Research Advisory Board, National Academy of Sciences, Washington, D.C. REFERENCES: A. S. Gates, Jr., Laurence Shuman, R. K. Thulman, T. H. Urdahl.

HOFMEISTER, M. H., Sales Engr., Bell and Gossett Co., Morton Grove, Ill. REFERENCES: H. A. Lockhart, R. E. Moore, L. S. Oosten, L. J. Smith.

HUGHES, A. D., Prof. of Mech. Engrg., Oregon State College, Corvallis, Ore. REFERENCES: W. C. Baker, B. W. Farnes, W. H. Martin*, R. T. Mudge.

JOHNSON, J. C., Jr., Mech. Engr., American Machine & Foundry Co., Raleigh, N.C. REFERENCES: R. G. Huebscher, C. M. Humphreys, G. V. Parmelee, Cyril Tasker.

KALLIS, WALTER, Sales Engr., Hudson Plumbing Supplies Ltd., Toronto, Ont., Canada. REFERENCES: J. D. Coates, G. H. Hopper, S. A. Jennings, William Philip.

LAWRENCE, W. J., Designer, National Research Council, Chalk River, Ont., Canada. REFERENCES: G. E. Cole, W. B. Horswill, J. L. Neilans, C. E. W. Watson.

LOUGHBOROUGH, H. A., Sales Engr., Marshall, Neil & Pauley Inc., Dallas, Tex. REFERENCES: T. R. Frymire, I. M. Goland, J. F. Marshall, H. J. Martyn, Jr.

MATTHEWS, F. L., Mech. Engr., Corps of Engrs., Alaska District, Anchorage, Alaska. REFERENCES: J. C. Dingwall*, S. R. Ludlow*, B. E. Maxon*, R. O. Moss*.

MCDOUGALL, B. M., Asst. Sales Mgr., Kennard Corp., St. Louis, Mo. REFERENCES: W. R. Barbeck, J. E. Dube, R. P. Kipp*, R. H. Spangler.

MIN, TAO-CHANG, Mech. Engr., Tennessee Valley Authority, Div. of Design, Knoxville, Tenn. REFERENCES: W. R. Chambers*, J. C. McAmis, Jr.*, R. C. Robertson*, J. M. Tucker*.

OLSON, R. B., Resident Engr., Charles S. Leopold Engineers, Philadelphia, Pa. REFERENCES: R. H. Ackermann, F. H. Buzzard, John Everetts, Jr., C. S. Leopold.

PLATTS, C. E., Mech. Draftsman, Howard F. McCandless, Fresno, Calif. REFERENCES: R. M. Faucett*, H. F. McCandless, O. D. Paulson, D. L. Williams.

PULLEN, P. R., Mech. Engr., Dealer Supply Co., Rapid City, S.D. REFERENCES: H. C. Kugeler, C. O. Mackey, B. E. Quinn*, G. H. Stoffer.

ROBBINS, I. M., Mech. Designer, Burns & Roe, New York, N.Y. REFERENCES: William Applegate*, Martin King*, Maurice Kravitz*, Joseph Robbins*.

ROSE, R. M., Sales Engr., Johnson Service Co., Cleveland, Ohio. REFERENCES: J. M. Black, Dennis Boggs, P. D. Gayman, W. M. Rowe.

RYAN, J. D., Sales Engr., Cooper Supply Co., Tulsa, Okla. REFERENCES: D. M. Allen, W. F. Ryan, F. M. Thomas, R. W. Winget.

*Non-member

SAGER, H. G., Design Engr., Newport News Shipbuilding and Dry Dock Co., Newport News, Va. REFERENCES: J. E. Harding, G. B. Johnson, E. A. Nixon*, G. B. Phillips.

SCHILLING, R. R., Mech. Engr., Tinsley, Higgins & Lighter, Des Moines, Ia. REFERENCES: T. R. Johnson, J. F. Sandfort, B. A. Schwirtz, D. B. Stevenson, Jr.

SMITH, T. J., Chicago District Mgr. The Powers Regulator Co., Chicago, Ill. REFERENCES: C. A. Gustafson, W. G. Pennington, H. J. Prebensen, K. M. Stevens.

SOUTHERLAND, W. H., Jr., Design Engr., Newport News Shipbuilding & Dry Dock Co., Newport News, Va. REFERENCES: J. S. Doolittle*, J. E. Harding, G. B. Johnson, D. E. Phillips.

SPANGLER, R. H., Pres., R. H. Spangler & Co., St. Louis, Mo. REFERENCES: J. H. Carter, F. E. Ince, J. B. Killebrew, W. A. Russell.

STUTHEIT, A. A., Sales Engr., Paul J. Grunau Co., Milwaukee, Wis. REFERENCES: Bert Fredericksen, J. E. Illingworth, J. A. Lofte, H. W. Schreiber.

SWAN, H. M., Sales Repr., Titusville Iron Works, New York, N.Y. REFERENCES: C. L. Chase, H. R. Kornblum, E. C. Schmidt*, R. L. Stinard.

TIETJE, P. E., Engr., Lincoln Bouillon & Assoc., Seattle, Wash. REFERENCES: Lincoln Bouillon, L. F. Christofferson, H. T. Griffith, H. M. Hendrickson.

VAN ALST, G. G., Buyer, Marshall Welles, Portland, Ore. REFERENCES: V. A. Beers, L. J. Harrington, K. R. Murhard, S. W. Wallace, Jr.

VILLELLI, F. T., Engr., Bon Heating Co., Milwaukee, Wis., REFERENCES: C. H. Amundson, R. P. Bon, Bert Fredericksen, F. E. Graper.

WEHLAGE, E. F., Mech. Engr., Neisner Brothers, Inc., Rochester, N.Y. REFERENCES: W. C. Jones, S. H. Perkins, N. E. Sheldon, J. Q. Treadway.

REINSTATEMENT

ERICKSON, G. A. (*Advancement*) Mgr., Wood Conversion Co., St. Paul, Minn. REFERENCES: A. B. Algren, D. B. Anderson, R. E. Backstrom, F. B. Rowley.

ADVANCEMENTS

MELTZER, JOSEPH, Sr., Designer, Ebasco Services, Inc., New York, N.Y. REFERENCES: A. C. Chen*, Isidore Kooner*, Walter Parrs*, Irwin Smith.

*Non-Member

REYNOLDS, J. F., Vice Pres., Stokleys Services Inc., Norfolk, Va. REFERENCES: J. F. Boyenton, E. D. Duval, W. P. Robinson, J. M. Stokley*.

WYBLE, J. B., Mech. Engr., Bureau of Yards & Docks, Navy Dept., Washington, D.C. REFERENCES: H. K. Kugel, E. J. Morris, J. J. Nolan, W. L. Norrington.

OBITUARIES

LOUIS N. BEERS
Tucson, Ariz.

Louis N. Beers, a member of the Society since 1942, died in Tucson, Ariz. He was 63.

Born July 22, 1887, at Birch Run, Saginaw County, Mich., Mr. Beers graduated from Millington High School in Michigan in 1905 and completed ICS Courses in steam engineering and heating and ventilating.

He spent his entire career in the heating and ventilating field in either engineering, sales, or management capacities. Firms with which he was associated include the Taylor Supply Co., the Canton Pipe and Fittings Co., where he was a vice president for a number of years, the W. T. Andrew Co., and the Tucson Pipe and Supply Co., where he was employed at the time of his death.

Mr. Beers was a master mason of Ionic Lodge, Detroit; Redford Commandery, Detroit; Moslem Shrine; Diamond Lodge 100 F; and was a member of the United Commercial Travellers.

He is survived by his wife, Lucy, two sons, Lee and Lyle, a daughter, Madeline, and two grandchildren, Pat and Gary, all of Tucson.

The Officers and Council extend their sympathy.

GEORGE W. MARTIN
Ridgewood, N. J.

George W. Martin, a Life Member of the Society, died on August 29 in Ridgewood, N. J., after an illness of four months. He was 75 and was living in retirement at the time of his death.

Mr. Martin was born in Brooklyn, N.Y., August 8, 1876, and was graduated from Stevens Institute in 1899 with a degree in mechanical engineering. Before his retirement eight years ago, he was supervising engineer of the United States Realty and Improvement Co. and was chairman of the Research Committee of the Management Division, the Real Estate Board of New York.

Prior to his connection with the United States Realty and Improvement Co., he was president of New York Service Co. for many years. He was also a past president of the *New York District Heating Association*. Other firms with which he was associated during his career included M.D. Forbes Co.; C. W. Hunt Co.; Evans, Almirall & Co.; Ford, Bacon, and Davis; and The Babcock and Wilcox Co.

Mr. Martin joined the Society in 1911 and was elected to Life Membership in 1941. Society positions in which he served included the Committee on Research and the Committee to Confer with the Bureau of Mines. In addition, he contributed to several editions of THE GUIDE.

As well as being a member of ASHVE, Mr. Martin belonged to *ASME* and also represented the *National Association of Building Owners and Managers* on several committees.

The Council and Officers extend their sympathy to his wife Alice Wharton Martin, to his daughters, Margaret Martin Conant, Helen Martin Stearns, and Elizabeth Martin Trembicki, and to his six grandchildren.

ROBERT P. WHITMER
Bloomington, Ill.

Robert P. Whitmer, formerly vice president of American Foundry and Furnace Co. and a member of the Society since 1935, died August 15 in Bloomington, Ill.

Mr. Whitmer was born September 6, 1897, in Bloomington and attended

Northwestern Military and Naval Academy, Lake Geneva, Wis., and Northwestern University, Evanston, Ill. He received a law degree from Illinois Wesleyan University Law School.

Mr. Whitmer resigned from the American Foundry and Furnace Co. in July, 1950, after being with the firm 28 years. Upon leaving the firm, he expanded the manufacture and sale of a slide rule he had earlier perfected for measuring heat loss in buildings and was engaged in this business at the time of his death.

He served in the U.S. Field Artillery in World War I as a second lieutenant and as a technical adviser of the McLean County Fuel Oil Rationing Board from 1941 to 1945.

He was a member of the American Legion, *McLean County Bar Association*, and *American Bar Association*.

He is survived by his wife, Violet M. Whitmer, to whom the Officers and Council send their sympathy.

EDWARD T. MURPHY
San Francisco, Calif.

Edward T. Murphy, 71, senior vice president of Carrier Corp. and a member of its Board of Directors since 1930, passed away on August 21 in San Francisco after a brief illness.

Mr. Murphy, a Life Member of the Society and known as "Ned" throughout the air conditioning and refrigeration industry with which he grew up, was one of the seven founders of Carrier Engineering Corp. in 1915, predecessor of the present company. Years before this, as a young employee of Buffalo Forge Co., he worked with the late Dr. Willis H. Carrier when the latter devised and installed the first scientific air conditioning system in 1902.

Born in New York City in 1880, he graduated from Lehigh University with a degree in mechanical engineering in 1901. After a year with Bethlehem Steel Co., he went to Buffalo Forge and was immediately assigned as an assistant to Willis H. Carrier, himself only recently graduated from Cornell University.

The problem on which they were working was to control both temperature and humidity in the plant of

E. T. Murphy
San Francisco, Calif.

Sackett-Wilhelms Lithographing & Publishing Co. in Brooklyn, which, among many other publications, printed the humorous magazine of that day, "Judge."

The system finally devised was a success, and Mr. Murphy helped to complete the actual installation in the Brooklyn plant in 1903.

After an interlude as sales engineer for B. F. Sturtevant Co. in 1904-1906, he served as Philadelphia Manager for Buffalo Forge Co. and its subsidiary, Carrier Air Conditioning Company of America, from 1907 until Carrier Engineering Corp. was formed as an independent company in 1915.

Mr. Murphy was named secretary and shortly thereafter vice president of the new corporation and directed its sales and engineering activities in the Philadelphia area for the next 12 years. He continued as vice president of the present Carrier Corp. after its formation in 1930, and was elected to the Board of Directors. He later served in Newark, N.J., and was in charge of the Chicago district from 1934-1939, when he assumed responsibility for all marketing activities at the new headquarters of the corporation in Syracuse, N.Y.

Mr. Murphy moved to the West Coast late in 1949, and was active there in a consulting capacity up to the time of his brief illness.

Mr. Murphy, who joined the Society in 1915 and became a Life Member in 1945, served on the Society's Nominating Committee and authored a number of papers for presentation to the Society. He was president of the Eastern Pennsylvania Chapter in 1917 and a member of its board of governors in 1918 and 1919.

He was a member of the *American Society of Mechanical Engineers* and the *Air Conditioning and Refrigerating Machinery Association*. He also was a member of Theta Delta Chi and Sigma Xi.

Mr. Murphy is survived by his wife, Mrs. Doris Duncan Murphy, to whom the Officers and Council extend their sympathy.

ARTHUR W. THOMPSON
St. John, N.B., Canada

Arthur W. Thompson, a member of the Society, died by drowning June 21 in St. John, N.B., Canada. He was 61.

Mr. Thompson, who had been employed by the engineering firm of E. S. Stephenson & Co., Ltd., for the past 12 years, returned to St. John, Wednesday, June 20, following a business trip to Sackville. The same day, according to reports, he had visited his camp at Acamac to fish and had lost a reel. The following day he stated that he would return to the camp while enroute to Fredericton, to retrieve the reel and line. His body was found in approximately eight feet of water not far from the shore line, fully clothed and in rubber boots. A watch found on the body had stopped at 5 o'clock and it was believed that he drowned late Thursday afternoon.

Born in Alberta, Mr. Thompson was a veteran of the First World War, having served in the Grenadier Guard overseas from 1914 to 1918. He had spent his entire career in sales or installation phases of power, heating, and ventilation work. For many years after his discharge from the Canadian Army, he was associated with his father in the plumbing business in Halifax. Other firms with which he was connected included Darling Bros., Ltd., Montreal, and Iron Fireman Manufacturing, Montreal.

Mr. Thompson was a member of the St. Andrew's Curling Club and the Byng Boys Club.

He is survived by a sister, Mrs. A. J. Boyd, Montreal, and a nephew, Austin MacDougall, Windsor Junction, Nova Scotia, to whom the Officers and Council extend sympathy.

THE AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS

Headquarters: 51 Madison Ave., New York 10, N. Y. (Tel. Murray Hill 3 0291)

JOURNAL SECTION

OFFICERS

President.....Lauren E. Seeley
First Vice President.....Ernest Szekely
Second Vice President.....Reg F. Taylor
Treasurer.....Howard E. Sproull
Executive Secretary.....A. V. Hutchinson
Technical Secretary.....Carl H. Flink

COUNCIL

Lauren E. Seeley, *Chairman;* Ernest Szekely, *Vice Chairman.*

Three Years: John H. Fox, L. N. Hunter, Neil H. Petterson, Benjamin H. Spurlock, Jr.

Two Years: John E. Haines, John W. James, E. R. Queer, Graeme B. Supple.

One Year: Spencer W. Boyd, C. Rollins Gardner, J. Donald Kroeker, Charles O. Mackey, Lester T. Avery.

ADVISORY BOARD

Lester T. Avery, *Chairman;* Homer Addams, M. P. Blankin, S. E. Dibble, S. H. Downs, E. O. Eastwood, W. L. Fleisher, H. P. Gant, F. E. Giesecke, E. Holt Gurney, L. A. Harding, H. M. Hart, C. V. Haynes, D. D. Kimball, G. L. Larson, S. R. Lewis, A. J. Offner, F. B. Rowley, A. E. Stacey, Jr., G. L. Tuve, A. C. Willard, C. E. A. Winslow and B. M. Woods.

COUNCIL COMMITTEES

Executive: Ernest Szekely, *Chairman;* Reg F. Taylor, Howard E. Sproull.

Finance: Reg F. Taylor, *Chairman;* John W. James, Neil H. Peterson, Howard E. Sproull, *Ex-Officio.*

Ways and Means: John W. James, *Chairman;* Irwin W. Cotton, John E. Haines, Charles E. Price, Reg F. Taylor.

Membership: C. Rollins Gardner, *Chairman;* John E. Haines, J. Donald Kroeker.

Program and Papers: E. R. Queer, *Chairman;* John H. Fox, Charles O. Mackey.

Standards: Graeme B. Supple, *Chairman;* L. N. Hunter, Benjamin H. Spurlock, Jr.

Sub-Committee: M. S. Wunderlich, *Chairman;* J. C. Fitts, L. N. Hunter, L. G. Miller, L. F. Saunders, S. K. Smith, R. K. Thulman.

GENERAL COMMITTEES

Admission and Advancement: Glen D. Winans, *Chairman (one year);* Arthur W. Edwards *(two years);* Roswell Farnham *(three years).*

Publication: Theodore F. Rockwell, *Chairman;* Ralph P. Cook, Frank W. Hutchinson.

Guide: Peter B. Gordon, *Chairman;* Nathaniel Glickman, Peter J. Marschall, *(one year);* David B. Anderson, Burgess H. Jennings, Wayne E. Long *(two years);* Warren S. Harris, Frank J. Nunlist, Jr., Carl D. Shields *(three years).*

Charter and By-Laws: Howard E. Sproull, *Chairman;* Edward L. Crosby, George W. F. Myers.

F. Paul Anderson: Ernest Szekely, *Chairman;* Robert L. Blanding, Merrill F. Blankin, Joseph A. Cutler, Alfred E. Stacey, Jr.

Chapter Relations: John E. Haines *Chairman;* Arthur W. Edwards, Arthur J. Hess, Carl F. Kayan, Peter J. Marschall, D. M. Mills, John H. Ross.

Chapters Conference: J. R. Vernon, *Chairman;* W. E. Long, *Vice Chairman;* J. H. Carpenter, *Secretary.* Members and alternate members selected by local chapters are respectively:

ATLANTA: E. K. Jamison—J. J. O'Shea
BALTIMORE: G. B. Priester—E. L. Crosby
CENTRAL NEW YORK: J. H. Carpenter—A. L. Jones
CENTRAL OHIO: H. G. Hays—R. S. Curl
CINCINNATI: E. W. McNamee—J. J. Bechtol
CONNECTICUT: D. M. Hummel—Winfield Roeder
DELTA: J. S. Burke—Walter Cooke
EMPIRE STATE: R. B. Taylor—G. G. Davis
GOLDEN GATE: R. C. Cushing—N. H. Peterson
ILLINOIS: P. J. Marschall—G. W. Bornquist
INDIANA: W. R. Fenstermaker—C. F. A. Locke
INLAND EMPIRE: J. E. Hutsinpiller—J. C. Kelly
IOWA: R. S. Stover—
KANSAS CITY: C. W. Schumacher—H. H. Lewis
MANITOBA: William Glass—
MASSACHUSETTS: D. W. Blair—John Bonner
MEMPHIS: H. H. Wilson—
MIAMI VALLEY: C. D. Weaver—W. R. Budde
MICHIGAN: C. F. Donohoe—L. A. Burch
MINNESOTA: G. M. Kendrick—E. F. Snyder, Jr.
MONTREAL: R. R. Noyes—J. G. Chenevert
NEBRASKA: K. E. Martin—S. W. Black
NEW YORK: Carl F. Kayan—Ernst Graber
NORTH CAROLINA: R. O. McGary—L. L. Vaughan
NORTH TEXAS: R. G. Lyford—R. E. Allison
NORTHEASTERN OKLAHOMA: V. W. Miles—R. E. Pauling
NORTHERN OHIO: John Richmond—W. M. Rowe
OKLAHOMA: W. J. Collins—F. X. Loeffler
ONTARIO: William Philip—N. W. Kingsland
OREGON: H. W. McKenzie—R. C. Chewning
PACIFIC NORTHWEST: R. M. Stern—
PHILADELPHIA: F. H. Buzzard—C. J. Force
PITTSBURGH: W. D. Simpson—B. R. Small
ROCKY MOUNTAIN: H. L. Wray—B. H. Spurlock, Jr.
ST. LOUIS: J. S. Rosebrough—C. H. Burnap
SHREVEPORT: R. M. Hood—S. W. Beaty
SOUTH TEXAS: C. L. Fleming—G. J. Collins
SOUTHERN CALIFORNIA: L. J. Helms—M. C. Greiner
SOUTHWEST TEXAS: W. E. Long—I. W. Wilke
UTAH: A. R. Curtis—D. R. Wilde
VIRGINIA: J. F. Boyenton—J. E. White
WASHINGTON, D.C.: F. M. Thuney—R. K. Thulman
WESTERN MICHIGAN: V. H. Hill—K. E. Robinson
WESTERN NEW YORK: Joseph Davis—Roswell Farnham
WISCONSIN: J. R. Vernon—B. M. Kluge

Committee on Research: Irwin W. Cotton, *Chairman;* R. S. Dill, *Vice Chairman;* Cyril Tasker, *Director of Research.*

Three Years: A. B. Algren, John Everetts, Jr., T. H. Smoot, Thomas A. Walters, William N. Witheridge.

Two Years: Carl F. Boester, Robert C. Cross, Richard S. Dill, Arthur J. Hess, Harold A. Lockhart.

One Year: Irwin W. Cotton, Nathaniel Glickman, Walter A. Grant, L. N. Hunter, Richard D. Madison.

Executive Committee: Irwin W. Cotton, *Chairman;* R. S. Dill, *Vice Chairman;* A. B. Algren, R. C. Cross, H. A. Lockhart.

Technical Advisory Committees for 1951:

Air Cleaning: A. B. Algren*, *Chairman;* R. C. Cross*, *Vice Chairman;* R. B. Crepps, R. S. Dill*, L. L. Dollinger, Jr., O. C. Eliason, B. G. Evans, R. S. Farr, C. D. Graham, A. J. Hess*, A. B. Hubbard, G. P. Landgraf, K. W. MacKenzie, Arthur Nutting, G. W. Penney, S. L. Root, Jr., C. B. Rowe, R. P. Warren, W. B. Watterson.

Air Distribution: G. B. Priester, *Chairman;* H. F. Brinen, R. M. Conner, S. H. Downs, Linn Helander, F. B. Holgate, W. O. Huebner, W. W. Kennedy, R. D. Madison*, G. E. McElroy, L. G. Miller, H. C. Pierce, C. H. Randolph, T. H. Troller, R. D. Tutt, G. L. Tuve.

Combustion: T. H. Smoot*, *Chairman;* P. R. Achenbach, R. B. Engdahl, H. G. Hays, R. C. Johnson, W. B. Kirk, S. J. Levine, H. R. Limbacher, A. A. Marks, J. W. Miller, W. M. Myler, Jr., E. A. Norman, Jr., K. O. Schlenner, R. K. Thulman, L. C. Webb, D. L. Wooden.

Cooling Load: W. E. Zieber, *Chairman;* K. O. Alexander, John Everetts, Jr.*, W. F. Friend, R. H. Heilman, H. W. Heisterkamp, R. C. Jordan, C. F. Kayan, J. N. Livermore, C. O. Mackey, J. P. Stewart.

Heat Flow Through Glass: R. A. Miller, *Chairman;* A. B. Algren*, W. J. Arner, A. H. Baker, F. L. Bishop, E. W. Conover, W. B. Ewing, J. E. Frazier, J. S. Herbert, D. B. Muir, F. W. Preston, C. A. Richardson, Vic Sanders, H. B. Vincent, J. R. Young.

Heat Pump: R. C. Jordan, *Chairman;* E. R. Ambrose, C. F. Boester*, F. R. Elienberger, W. F. Friend, C. P. Kayan, E. N. Kemler, J. Donald Kroeker, E. P. Palmatier, E. B. Penrod, S. S. Sanford.

Heating Load: W. S. Harris, *Chairman;* R. A. Biggs, A. I. Brown, R. S. Dill*, A. S. Griswold, J. M. Hartman, H. A. Lockhart*, L. G. Miller, T. F. Rockwell, S. I. Rottmayer, M. W. Shearer.

Hot Water and Steam Heating: John W. James, *Chairman;* H. C. Day, W. S. Harris, L. N. Hunter*, A. T. Jones, E. G. Keller, H. A. Lockhart*, M. W. McRae, S. K. Smith, Benjamin Spieth, M. H. Westerberg.

Human Calorimetry: G. L. Tuve, *Chairman;* E. F. DuBois, M.D., Nathaniel Glickman*, J. D. Hardy, E. R. Queer, L. E. Seeley, C. P. Yaglou.

Industrial Ventilation: W. N. Witheridge*, *Chairman;* J. L. Alden, A. D. Brandt, J. H. Clarke, R. D. Foley, W. C. L. Hemeon, W. O. Huebner, J. M. Kane, M. G. Kershaw, L. L. Lewis, G. E. McElroy, H. A. Mosher, B. F. Postman, K. E. Robinson, Leslie Silverman, B. R. Small, B. P. Warren, H. E. Ziel.

Insulation: M. W. Keyes, *Chairman;* R. E. Backstrom, L. A. Barron, C. B. Bradley, P. D. Close, R. B. Crepps, R. C. Cross*, N. B. Hutcheon, F. A. Joy, W. A. Knudson, E. E. Queer, H. E. Robinson, Vic Sanders, T. D. Stafford, L. V. Teesdale, R. K. Thulman.

Odors: T. H. Urdahl, *Chairman;* L. H. Beck, N. E. Berry, W. V. Consolazio, W. A. Grant*, E. P. Heckel, A. B. Hubbard, G. W. Mrek, Amos Turk, W. N. Witheridge*.

Panel Heating and Cooling: P. B. Gordon, *Chairman;* A. B. Algren*, John Everetts, Jr.*, L. N. Hunter*, John W. James, J. S. Locke, S. K. Smith, J. M. van Nieukerken.

Group A — Heat Distribution Within and Behind the Panel: A. B. Algren*, *Chairman;* R. A. Biggs, R. S. Dill*, H. L. Flodin, F. E. Giesecke, J. H. Hart, G. D. Lain, R. L. Maher, D. L. Mills, C. W. Nessell, F. E. Parsons, S. I. Rottmayer, R. T. Schoerner, E. E. Scott, S. K. Smith, R. K. Thulman, S. M. Van Kirk, W. J. Widmer, L. H. Yeager.

Group B — Heat Transfer Between the Panel and the Space: J. M. van Nieukerken, *Chairman;* C. M. Ashley, C. F. Boester*, W. S. Harris, Linn Helander, J. W. James, C. F. Kayan, H. A. Lockhart*, W. E. Long, C. O. Mackey, R. A. Miller, G. W. Penney, H. F. Randolph, R. E. Sexton, H. E. Wheeler, G. L. Wiggs.

Group D — Controls: J. S. Locke, *Chairman;* A. B. Algren*, H. W. Alyea, Louis Barlus, S. D. Browne, R. L. Campbell, W. J. Hajek, A. J. Keating, H. H. Kieckheier, W. H. Kliever, H. T. Kuceta, J. F. McCauley, P. F. Ness, J. K. M. Pryke, C. W. Signor, N. D. Skinner, E. F. Snyder.

Physiological Research: M. K. Fahnestock, *Chairman;* Lester T. Avery, Dr. Thomas Bedford, Capt. A. R. Behnke, Jr. (MC) USN, H. S. Belding, William Bruce, Dr. A. C. Burton, E. F. Du Bois, M.D., Col. A. P. Gagge, USAF (MSC), Nathaniel Glickman*, F. K. Hick, M.D. R. W. Keeton, M.D., D. H. K. Lee, M.D., R. D. Madison*, C. L. Taylor, C.-E. A. Winslow.

Sensations of Comfort: C. S. Leopold, *Chairman;* Lester T. Avery, John Everetts, Jr.*, M. K. Fahnestock, Nathaniel Glickman*, W. A. Grant*, A. J. Hess*, A. A. Menke.

Sorbents: G. L. Simpson, *Chairman;* G. C. F. Asker, F. C. Dehler, John Everetts, Jr.*, A. S. Gates, Jr., E. W. Gifford, H. W. Heisterkamp, E. E. McLaughlin, J. C. Patterson, F. J. Swaney.

Sound Control: T. A. Walters*, *Chairman;* C. M. Ashley, P. H. Geiger, Sidney Gordon, W. F. Hagen, H. C. Hardy, E. M. Herrmann, F. B. Holgate, G. C. Kerr, M. W. Keyes, R. D. Madison*, T. H. Troller, George Wohlberg.

Weather Design Conditions: W. M. Wallace, II, *Chairman;* P. D. Close, R. S. Dill* F. J. Friedman, W. L. Holladay, H. K. McCain, T. H. Urdahl.

SPECIAL COMMITTEES

International Joint Committee on Psychrometric Data: Dr. Baldwin M. Woods, Berkeley, Calif., *Chairman;* B. A. Dmitriett, New York, N. Y. *Secretary;* H. H. Bruce, London; G. A. Bull, London; C. S. Cragoe, Washington, D. C.; John A. Goff, Philadelphia; L. P. Harrison, Washington, D. C.; T. J. G. Henry, Toronto; B. H. Jennings, Evanston, Ill.; Dr. F. G. Keyes, Cambridge, Mass.; R. F. Legget, Ottawa; S. G. Rosen, Washington, D. C.; P. A. Sheppard, London; J. L. York, Ann Arbor, Mich.

Public Relations: Charles E. Price, *Chairman;* George La Roi, Howard W. Pound, Oliver J. Prentice, J. Rexford Vernon.

•

Nominating: A. J. Hess, Los Angeles, Calif., *Chairman;* B. L. Evans, St. Louis, *Secretary;* P. R. Achenbach, Washington, D.C.; F. W. Chambers, Toronto, Ont.; I. W. Cotton, Indianapolis; C. B. Gamble, New Orleans; Leo Garneau, Montreal, Que.; D. M. Hummel, New Haven, Conn.; E. H. Langdon, Seattle; A. E. Stacey, Jr., Syracuse, N.Y.; G. L. Tuve, Cleveland. *Alternates:* P. J. Marschall, Chicago; W. M. Wallace, II, Durham, N.C.

*Member of Committee on Research.

JOURNAL SECTION

OFFICERS OF LOCAL CHAPTERS AND STUDENT BRANCHES

(46 Chapters—11 Student Branches)

● **ATLANTA:** Organized 1937. Headquarters, Atlanta, Ga. Meets, Second Monday. PRESIDENT, E. K. Jamison, P.O. Box 1248, Atlanta, Ga. SECRETARY, G. B. Hightower, 545 Piedmont Ave., N.E., Atlanta.

● **BALTIMORE:** Organized 1949. Headquarters, Baltimore, Md. Meets, Third Wednesday. PRESIDENT, W. P. Flanigan, 5508 Greenleaf Rd., Baltimore 10. SECRETARY, F. M. Hewitt, 11 E. 21st St., Baltimore 18.

● **CENTRAL NEW YORK:** Organized 1944. Headquarters, Syracuse, N. Y. PRESIDENT, J. H. Carpenter, 3515 Midland Ave., Syracuse. SECRETARY, H. K. Ormsby, 205 S. Townsend St., Syracuse 2.

● **CENTRAL OHIO:** Organized 1944. Headquarters, Columbus, Ohio. Meets, Third Monday. PRESIDENT, R. S. Curl, 590 Oak St., Columbus. SECRETARY, N. T. Hess, 65 E. Goodale St., Columbus.

● **CINCINNATI:** Organized 1932. Headquarters, Cincinnati, Ohio. Meets, First Tuesday. PRESIDENT, J. J. Bechtol, P.O. Box 1667, Cincinnati 1. SECRETARY, R. C. Beineke, 626 Broadway, Cincinnati 2.

● **CONNECTICUT:** Organized 1940. Headquarters, New Haven, Conn. Meets, Third Thursday. PRESIDENT, A. J. Lawless, 110 Whitney Ave., New Haven. SECRETARY, R. W. Sidbury, 236 Grand St., Waterbury 91.

● **DELTA:** Organized 1939. Headquarters, New Orleans, La. Meets, Second Tuesday. PRESIDENT, Theodore Offner, 1000 S. Peters St., New Orleans. SECRETARY, H. L. Salaun, 317 Baronne St., New Orleans.

● **EMPIRE STATE CAPITAL:** Organized 1951. Headquarters, Albany, N. Y. PRESIDENT, D. A. Carofano, 1821 Highland Ave., Troy. SECRETARY, G. G. Davis, 323 State St., Schenectady.

● **GOLDEN GATE:** Organized 1937. Headquarters, San Francisco, Calif. Meets, First Thursday. PRESIDENT, R. C. Cushing, 1136 Howard St., San Francisco 3. SECRETARY, T. J. White. 625 Market St., San Francisco 5.

● **ILLINOIS:** Organized 1906. Headquarters, Chicago, Ill. Meets, Second Monday. PRESIDENT, George W. Bornquist, 605 W. Washington Blvd., Chicago 6. SECRETARY, G. V. Zintel, 1217 W. Washington Blvd., Chicago 7.

● **INDIANA:** Organized 1943. Headquarters, Indianapolis Ind. Meets, Fourth Friday. PRESIDENT, F. C. Barton, 912 K. of P. Bldg., Indianapolis. SECRETARY, R. C. Blackman, 5505 N. Illinois St., Indianapolis 8.

● **INLAND EMPIRE:** Organized 1950. Headquarters, Spokane, Wash. Meets, First Friday after First Tuesday. PRESIDENT, I. E. Marque, 3803 N. Atlantic, Spokane. SECRETARY, R. J. Harris, 116 N. Division St., Spokane 8.

● **IOWA:** Organized 1940. Headquarters, Des Moines, Ia. Meets, Second Tuesday. PRESIDENT, C. H. McGuiness, 712 Park St., Des Moines. SECRETARY, J. F. Sandfort, M. E. Dept., Iowa State College, Ames.

● **KANSAS:** Organized 1951. Headquarters, Wichita, Kan. PRESIDENT, R. F. Bauer, 434 N. Rock Island, Wichita. SECRETARY, E. G. Fahnestock, P.O. Box 2581, Hillside Station, Wichita.

● **KANSAS CITY:** Organized 1917. Headquarters, Kansas City, Mo. Meets, First Monday. PRESIDENT, C. W. Schumacher, 1920-22 Grand Ave., Kansas City, Mo. SECRETARY, G. H. Stoffer, 200 Land Bk. Bldg., Kansas City 6, Mo.

● **MANITOBA:** Organized 1935. Headquarters, Winnipeg, Man., Canada. Meets, Third Thursday. PRESIDENT, J. F. Bertram, 550 Notre Dame Ave., Winnipeg. SECRETARY, A. K. Piercy, 310 Time Bldg., Winnipeg.

● **MASSACHUSETTS:** Organized 1912. Headquarters, Boston, Mass. Meets, Third Tuesday. PRESIDENT, John Bonner, 92 Broadway, Cambridge 42. SECRETARY, L. R. Geissenhainer, 89 Broad St., Boston 10.

● **MEMPHIS:** Organized 1944. Headquarters, Memphis, Tenn. Meets, Third Monday. PRESIDENT, R. E. Larkin, 515 W. Clover Dr., Memphis. SECRETARY, A. T. Bevil, 212 Robinson Bldg., 160 Union, Memphis 3.

● **MIAMI VALLEY:** Organized 1950. Headquarters, Dayton, Ohio. Meets, First Wednesday. PRESIDENT, C. D. Weaver, 1136 U.B. Bldg., Dayton 2. SECRETARY, R. W. Kimmel, 947 Westminster Pl., Dayton 9.

● **MICHIGAN:** Organized 1916. Headquarters, Detroit, Mich. Meets, First Monday after 10th of month. PRESIDENT, G. W. Akers, Box 238, R.F.D. 2, Rochester, Mich. SECRETARY, R. H. Oberschulte, 316 McKerchey Bldg., Detroit 1.

● **MINNESOTA:** Organized 1918. Headquarters, Minneapolis, Minn. Meets, First Monday. PRESIDENT, E. F. Snyder, Jr., 4324 Zenith Ave. N, Minneapolis 22. SECRETARY, J. A. Holbrook, 65 North 17th St., Minneapolis 3.

● **MONTREAL:** Organized 1936. Headquarters, Montreal, Que., Canada. Meets, Third Monday. PRESIDENT, J. G. Chenevert, 1440 St. Catherine St. W., Montreal. SECRETARY, B. J. Horsburgh, 637 Craig W., Rm. 212, Montreal.

● **NEBRASKA:** Organized 1940. Headquarters, Omaha, Neb. Meets, Second Tuesday. PRESIDENT, K. E. Martin, 204 Barker Bldg., Omaha 2. SECRETARY, O. J. Smith, 233 Grain Exchange Bldg., Omaha 2.

● **NEW YORK:** Organized 1911. Headquarters, New York, N. Y. Meets, Third Monday. PRESIDENT, Ernst Graber, 215 Hollywood Ave., Douglaston, L. I. SECRETARY, Carl H. Flink, 51 Madison Ave., New York 10.

● **NORTH CAROLINA:** Organized 1939. Headquarters, Durham, N. C. Meets, Quarterly. PRESIDENT, R. O. McGary, 2015 Dilworth Rd. E., Charlotte 3. SECRETARY, J. A. Rice, 719 Worthington Ave., Charlotte.

● **NORTH TEXAS:** Organized 1938. Headquarters, Dallas, Tex. Meets, Third Monday. PRESIDENT, R. G. Lyford, 2415 N. Pearl St., Dallas. SECRETARY, P. N. Vinther, 929 Mercantile Securities Bldg., Dallas 1.

● **NORTHEASTERN OKLAHOMA:** Organized 1948. Headquarters, Tulsa, Okla. PRESIDENT, R. F. Shoemaker, 1136 S. Peoria, Tulsa. SECRETARY, F. M. Thomas, 1525 E. 35th Pl., Tulsa 5.

● **NORTHERN OHIO:** Organized 1916. Headquarters, Cleveland, Ohio. Meets, Second Monday. PRESIDENT, John Richmond, 10210 Woodland Ave., Cleveland 4. SECRETARY, R. G. Huebscher, 7218 Euclid Ave., Cleveland 3.

● **OKLAHOMA:** Organized 1933. Headquarters, Oklahoma City, Okla. Meets, Second Monday. PRESIDENT, H. Carnahan, 320 Oklahoma Natural Gas Bldg., Oklahoma City 2. SECRETARY, W. J. Collins, Jr., 224 Oklahoma Natural Gas Bldg., Oklahoma City.

● **ONTARIO:** Organized 1922. Headquarters, Toronto, Ont., Canada. Meets, First Monday. PRESIDENT, William Philip, 5 Barbara Crescent, Toronto, Ont. SECRETARY, H. R. Roth, 57 Bloor St., W., Toronto, Ont.

● **OREGON:** Organized 1939. Headquarters, Portland, Ore. Meets, Thursday after First Tuesday. PRESIDENT, H. W. McKenzie, 399 Murray Ave., Beaverton. SECRETARY, R. P. Lankow, 3408 S.E. Hawthorne Blvd., Portland 15.

● **PACIFIC NORTHWEST:** Organized 1928. Headquarters, Seattle, Wash. Meets, Second Tuesday. PRESIDENT, C. A. Pangborn, 312 2nd and Cherry Bldg., Seattle 4. SECRETARY, W. B. Pride, 3111 Dose Terrace, Seattle 44.

● **PHILADELPHIA:** Organized 1916. Headquarters, Philadelphia, Pa. Meets, Second Thursday. PRESIDENT, E. K. Wagner, 2240 N. Bread St., Philadelphia 32. SECRETARY, A. M. Robertson, 1200 Locust St., Philadelphia 7.

● **PITTSBURGH:** Organized 1919. Headquarters, Pittsburgh, Pa. Meets, Third Monday. PRESIDENT, W. D. Simpson, 301 Standard Life Bldg., Pittsburgh 22. SECRETARY, E. H. Riesmeyer, Jr., 231-33 Water St., Pittsburgh 22.

● **ROCKY MOUNTAIN:** Organized 1944. Headquarters, Denver, Colo. Meets, First Wednesday. PRESIDENT, B. H. Spurlock, Jr., Dept. of M. E., University of Colorado, Boulder, Colo. SECRETARY, J. W. Braak, 1230 California St., Denver, Colo.

● **ST. LOUIS:** Organized 1918. Headquarters, St. Louis, Mo. Meets, Second Tuesday. PRESIDENT, L. L. Hamig, 1706 Olive St., St. Louis 3. SECRETARY, J. F. Naylor, Jr., 2335 S. Grand Ave., St. Louis 4.

● **SHREVEPORT:** Organized 1948. Headquarters, Shreveport, La. Meets, Third Thursday. PRESIDENT, S. W. Beaty, P.O. Box 1734, Shreveport 4, La. SECRETARY, W. S. Evans, 614 Johnson Bldg., Shreveport.

● **SOUTH TEXAS:** Organized 1938. Headquarters, Houston, Tex. Meets, Third Friday. PRESIDENT, R. J. Salinger, 910 Bankers Mtg. Bldg., Houston 2. SECRETARY, E. G. Floeter, Jr., P.O. Box 6006, Houston 6.

● **SOUTHERN CALIFORNIA:** Organized 1930. Headquarters, Los Angeles, Calif. Meets, Third Wednesday. PRESIDENT, M. C. Greiner, 1599 Club View Dr., Los Angeles 24. SECRETARY, L. B. Davenport, 137 S. Anderson St., Los Angeles 33.

● **SOUTHWEST TEXAS:** Organized 1946. Headquarters, San Antonio, Tex. Meets, Third Tuesday. PRESIDENT, I. W. Wilke, P.O. Box 1154, Austin. SECRETARY, D. E. Locher, Box 949, 224 S. Staples St., Corpus Christi.

● **UTAH:** Organized 1944. Headquarters, Salt Lake City, Utah. Meets, First Wednesday. PRESIDENT, R. H. East, 1086 E. 21st St., Salt Lake City. SECRETARY, D. R. Wilde, 204 Dooly Bldg., Salt Lake City 1.

● **VIRGINIA:** Organized 1946. Headquarters, Norfolk, Va. Meets Third Wednesday. PRESIDENT, J. F. Boyenton, 400 W. 24 St., Norfolk 8. SECRETARY, J. E. Harding, Apt. R-2, St. James Terrace, Newport News.

● **WASHINGTON, D. C.:** Organized 1935. Headquarters, Washington, D. C. Meets, Second Wednesday. PRESIDENT, S. R. Allen, 942 Washington Bldg., Washington 5. SECRETARY, P. H. Louehran, Jr., 4513 49th St., N.W., Washington 16.

● **WESTERN MICHIGAN:** Organized 1931. Headquarters, Grand Rapids, Mich. Meets, Second Monday. ACTING PRESIDENT, W. C. DeRoo, 500 E. 8th St., Holland, Mich. SECRETARY, H. R. Limbacher, 760 Vine St. E., Kalamazoo.

● **WESTERN NEW YORK:** Organized 1919. Headquarters, Buffalo, N. Y. Meets, Second Monday. PRESIDENT, T. F. Killeen, 374 Delaware Ave., Buffalo 2. SECRETARY, R. E. Lang, 140 Meadow Lane, Kenmore 23.

● **WISCONSIN:** Organized 1922. Headquarters, Milwaukee, Wis. Meets, Third Monday. PRESIDENT, H. F. Brinen, 226 Kenzie Ave., Racine. SECRETARY, L. C. Plaehn, 914 N. Broadway, Milwaukee.

Student Branches

● **COLLEGE OF CITY OF NEW YORK:** Organized 1949. Headquarters, New York, N. Y. PRESIDENT, Seymour Weinberg, 2147 72nd Street, Brooklyn 4. SECRETARY, Benjamin Karp, 524 Berriman St., Brooklyn 8.

● **LOUISIANA POLYTECHNIC INSTITUTE:** Organized 1949. Headquarters, Ruston, La. PRESIDENT, W. G. McMullen, Box 472, Tech Station, Ruston. SECRETARY, R. L. Gorton, Box 184, Tech Station, Ruston.

● **NORTH CAROLINA STATE COLLEGE:** Organized 1948. Headquarters, Raleigh, N. C. PRESIDENT, Sydney Narvey, 5-B Vetville, State College Station, Raleigh. SECRETARY, E. A. Travis, Jr., P.O. Box 5335, Bagwell Dormitory, Raleigh.

● **OKLAHOMA A. & M. COLLEGE:** Organized 1950. Headquarters, Stillwater, Okla. PRESIDENT, O. A. Brynie, 507 Midi, Vet Village, Stillwater. SECRETARY, D. W. Ray, E126 Bennett Hall, Stillwater.

● **OREGON STATE COLLEGE:** Organized 1949. Headquarters, Corvallis, Ore. Meets, First Wednesday after First Tuesday. PRESIDENT, R. J. Kemper, Jr., 645 N. 4th, Corvallis. SECRETARY, J. M. Temple:. 720 Kings Rd., Corvallis.

● **PURDUE UNIVERSITY:** Organized 1948. Headquarters, W. Lafayette, Ind. CHAIRMAN, N. J. Kirch, 922 Highland Ave., Lafayette. SECRETARY, T. L. Burcham, 133 Salisbury St., W. Lafayette.

● **TEXAS A. & M. COLLEGE:** Organized 1946. Headquarters, College Station, Tex. Meets, Second and Fourth Tuesday. PRESIDENT, J. O. Kadel, Box 4034, College Station, Tex. SECRETARY, W. C. Haggard, Box 5227, College Station.

● **UNIVERSITY OF DETROIT:** Organized 1949. Headquarters, Detroit, Mich. Meets, First Tuesday. PRESIDENT, G. H. Williams, 18251 Washburn, Detroit 21. SECRETARY, R. H. Drake, 5598 Hurlbut, Detroit 13.

● **UNIVERSITY OF KANSAS:** Organized 1949. Headquarters, Lawrence, Kans. Address mail to Dr. Warren E. Snyder, chairman, Dept. of Mechanical Engineering, University of Kansas.

● **UNIVERSITY OF TEXAS:** Organized 1949. Headquarters, Austin, Tex. Meets, First and Third Tuesday. PRESIDENT, W. A. Cox, 560-D Deep Eddy Apts., Austin. SECRETARY, V. H. Miles, PHP Dorm J, Austin.

● **UNIVERSITY OF TORONTO:** Organized 1951. Headquarters, Toronto, Ont. CHAIRMAN, H. F. Sprage, 35 Harrison Ave., Aurora, Ont. SECRETARY, J. E. G. Blaiklock, 23 Isabella St., Toronto 5, Ont.

HOW TO MEASURE Bronze Valve Quality

Get THE LUNKENHEIMER research brochure on copper-base alloys

There are as many yardsticks to measure bronze valve quality as there are service applications. Each job has its own standard — and that's why it's important to know the basic facts behind the selection of valve metals. The new research brochure on "Lunkenheimer Copper-Base Alloys" will help you understand how and why valve bronzes are chosen for specific services. It will help *you* measure bronze valve quality for your own specific applications.

Out of the Lunkenheimer research program have come such outstanding developments as *Stemalloy**, the amazing bronze stem material which has actually been tested at more than 300,000 openings and closings — with live steam flowing through the lines. Millions are in service, and *not one* has ever been returned due to wear failure.

*Patented Alloy

Lunkenheimer Figure 2125 Bronze Valves cut your maintenance costs in many ways. Three basic designs, all in the 125 lb. class, have interchangeable bodies and parts to simplify your stock room problems. Check the cross sectional views on this page, and ask your distributor or write us direct for Circular 566, describing them in detail.

Write for copies of the research brochure on Copper-Base Alloys to The Lunkenheimer Co., Box 360-N, Cincinnati 14, Ohio.

Figure 2125 Double-Wedge Disc Rising Stem

Figure 2127 Solid-Wedge Disc Rising Stem

Figure 2129 Single-Wedge Disc Non-Rising Stem

BRONZE • IRON • STEEL

LUNKENHEIMER

THE ONE *Great* NAME IN VALVES

L-251-B

THE CHICAGO PUMP IS A BETTER PUMP

Figure V 9500—Type AVC Condensation Pump and Receiver. Receiver serves as base. Low inlet — suitable for floor mounting or shallow pit. No foundation bolts necessary. Ask for Bulletin 245.

. . . For Every Heating Purpose

Figure L 9700—Type CLL1 Vertical Condensation Pump. Extra heavy duty unit. Specifically designed for low return service and underground installations. Ask for Bulletin 255.

Get the pump that is specifically designed for the particular job. For below floor returns, for low vacuum systems, for small capacity high pressure requirements, for any standard heating system or any unusual condition there is a Chicago Heating Pump that will do the job better.

All ratings and receiver capacities meet or exceed ASHVE standards.

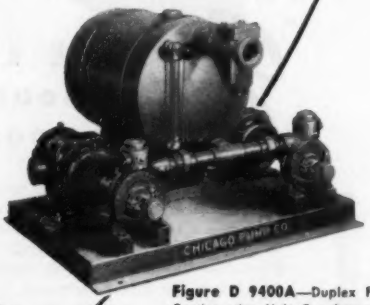


Figure D 9400A—Duplex FC Condensation Unit. For duty up to 50,000 EDR and discharge pressures up to 150 lbs. Ask for Bulletin 260.

Figure D 9900—Duplex Condo-Vac Return Line Vacuum and Boiler Feed Pump for vacuum heating systems. Pressures up to 40 lbs., and from 2500 to 150,000 EDR. Ask for Bulletin 270.

Figure D 9200—Sure Return Condensation Pump and Receiver. For systems up to 75,000 EDR and for low and medium pressures. Available in either single or duplex units. Ask for Bulletin 250.

CHICAGO PUMP COMPANY

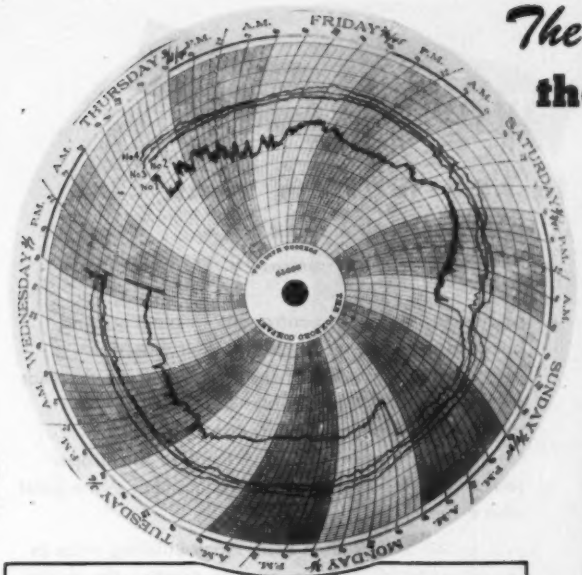
BUILDING and INDUSTRIAL DIVISION

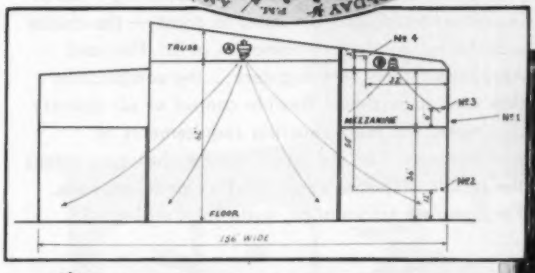
2300 WOLFRAM STREET — **CHICAGO 18, ILLINOIS**

Condo-Vac, Sure Return, AVC, LVC, Fire, House & Circulating Pumps
Pneumatic & Tankless Water Systems

Flush-Kleen Sewage Ejectors
Little Giant & Non-Clog Bilge Pumps
Pumps for every industrial use.

The Story of the TEMPERATURE CHART





(Above) Main section of building showing 6 of the 10 large Wing Revolving Heaters 62' above the floor.

(Left) View on the mezzanine, showing the smaller Wing Revolving Heaters located 21' above the mezzanine floor.

REPLACING an expensive but inadequate heating system, Wing Revolving Unit Heaters completely solved a difficult heating problem in a shipbuilding plant. The building is 156' wide by 802' long. A mezzanine is 42' by 21' to the cross beams by 802' long.

Wing

REVOLVING UNIT HEATERS

Ten Wing Revolving Unit Heaters with one-way revolving discharge outlets cover the section marked "A" on the diagram and shown in the upper photograph. Ten smaller Wing Revolving Unit Heaters with Design No. 8 revolving outlets cover the mezzanine shop marked "B" on the diagram and shown in the lower photograph. Fairly high working temperatures (75° F) were required and furnished. The chart from a recording thermometer, with bulbs located as shown, reveals graphically the even working temperatures, the relatively low ceiling temperatures and the fluctuating outdoor temperatures (32° to 75° F) over one week's time.

Write for further details and a copy of Bulletin HR-6

L. J. Wing Mfg. Co., 140 Vreeland Mills Rd., Linden, N. J.

Factories: Linden, N. J. and Montreal, Can.

In Europe: Etab. WANSON, Haren-Nord, Brussels, Belgium

Tri-Flex Aerovane

in 525 William Penn Place Building

Pittsburgh, Pennsylvania

Architects, engineers, contractors — planners and builders of tomorrow — choose their materials with care. The quality of the completed job depends on them. And the specialists responsible for the successful, dependable operation of an air conditioning system pay strict heed to the proper selection of the air distribution equipment... *the point where success is measured.*

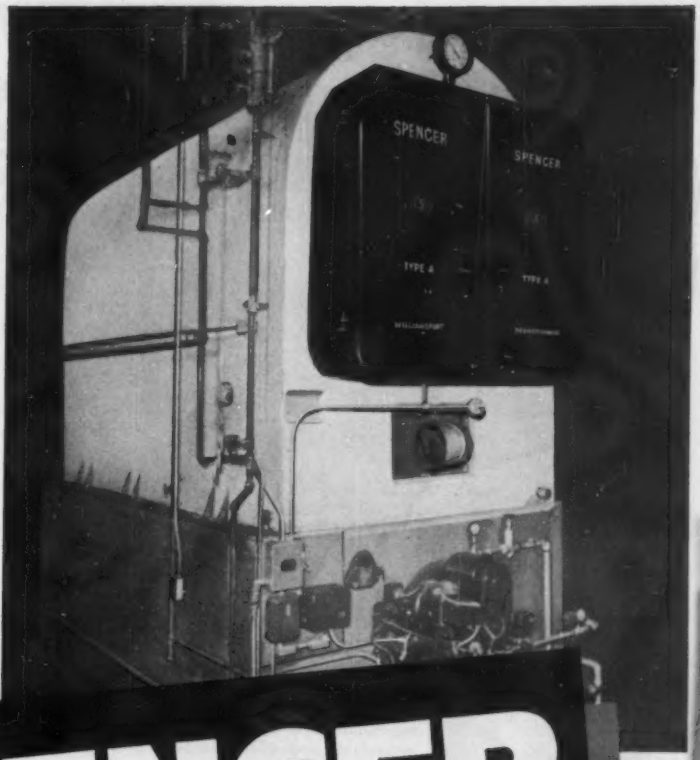
In the 525 William Penn Place Building — as in important buildings from coast to coast — the choice was the outstanding combination of Tri-Flex and Aerovane Grilles and Registers... the combination that insures maximum flexible control of air delivery ... meets the most exacting requirements of performance. For consistent quality that guarantees the results, standardize on Tri-Flex and Aerovane. For complete information, write for Catalog 48S.

TUTTLE & BAILEY inc

NEW BRITAIN, CONNECTICUT

ENGINEERED PRODUCTS FOR HEATING, AIR CONDITIONING AND VENTILATING

The modern new Father Mantignon High School in Cambridge, Massachusetts relies on Spencer Boilers like this for dependable heat and hot water.



SPENCER

THE QUALITY LINE OF HEATING BOILERS

THERE IS A SPENCER FOR EVERY BUILDING, FOR EVERY FUEL

Both cast iron and steel . . . a selection of 76 models . . . versatile, dependable, backed by more than sixty years of leadership . . . precision engineered and manufactured to give superior, *guaranteed* service.

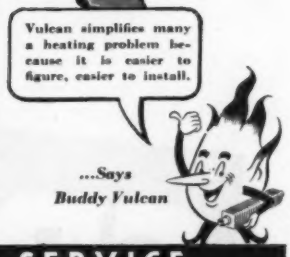
Write for Spencer Catalogue today.

SBI

SPENCER HEATER
LYCOMING-SPENCER DIVISION
WILLIAMSPORT LYCO PENNSYLVANIA

VULCAN
REPRESENTATIVES FROM COAST-TO-COAST

Vulcan representatives in principal cities from coast to coast are recognized authorities on heating and the application of Vulcan Radiation. They offer you real engineering know-how plus dependable service in the fields of *residential, commercial* and *institutional* heating. Call on them for advice . . . they'll help you save time and money.



...Says Buddy Vulcan

DEPENDABLE COUNTRYWIDE SERVICE

Albany, N. Y.
G. W. Heacock & Co., Inc.

Albuquerque, N. M.
Boyd Engineering Co.

Atlanta, Georgia
John A. Dodd Co.

Baltimore, Md.
F. C. Clifford

Birmingham, Ala.
Virgil A. Smith

Boston, Mass.
C. R. Swaney Co.

Bridgeport, Conn.
E. R. Clement, Inc.

Buffalo, N. Y.
Frank J. Weber & Assocs.

Charlotte, N. C.
Kirk Cousart & Assocs.

Chicago, Ill.
Roy O. Nelson Co.

Cincinnati, Ohio
Harry A. Pillen

Cleveland, Ohio
Tomlinson Steam Specialty Co.

Corpus Christi, Tex.
J. R. Dowdell & Co.

Dallas, Texas
J. R. Dowdell & Co.

Denver, Colo.
Appleton Engineering Co.

Des Moines, Iowa
Fred E. Triggs

Detroit, Mich.
James A. Hughes

El Paso, Texas
Boyd Engineering Co.

Houston, Texas
J. R. Dowdell & Co.

Indianapolis, Ind.
Jackson Engineering Co.

Jacksonville, Fla.
John C. Pastor

Kansas City, Mo.
H. H. Wright Co.

Knoxville, Tenn.
Charles F. Sexton

Los Angeles, Calif.
Norman S. Wright & Co.

Memphis, Tenn.
W. K. Hornbuckle

Milwaukee, Wis.
Hamscher & Williams

Minneapolis, Minn.
Uhl Co.

Missoula, Mont.
W. M. Walterskirchen

New Orleans, La.
Devlin Brothers

New York, N. Y.
A. F. Hinrichsen, Inc.

Omaha, Nebraska
D. E. McCulley

Philadelphia, Pa.
P. A. Cavanagh Co.

Pittsburgh, Pa.
Tutein Equipment Co.

Portland, Oregon
Norman S. Wright & Co.

Richmond, Virginia
Robert S. Lovelace

Salt Lake City, Utah
Midgley-Huber Co.

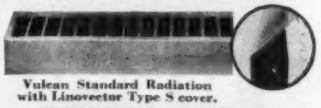
San Francisco, Cal.
Norman S. Wright & Co.

Scranton, Pa.
John P. Gilboy Co.

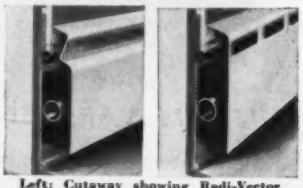
Seattle, Wash.
Norman S. Wright & Co.

St. Louis, Mo.
Bruce L. Evans Co.

Vulcan Standard Radiation with Linovector Type F cover.



Vulcan Standard Radiation with Linovector Type S cover.



Left: Cutaway showing Radi-Vector with Type L cover. Right: Type K cover.

Made in Canada under trade name of Heal Radiation by the Vapor Car Heating Company of Montreal.

The VULCAN Radiator Company
26 FRANCIS AVENUE
HARTFORD, CONNECTICUT

OVER A QUARTER CENTURY OF FIN-TUBE RADIATION

clean air costs less than dust!

AAF Electro-PL installation cleans air efficiently with low maintenance cost.

SIZE IS NOT A FACTOR

. . . for a plant to profit by "Clean Air"

SMALL manufacturer . . . or giant of industry . . . both have found American Air Filters a sound investment. Clean air quickly demonstrates its value by improving efficiency in shop and office. People work better—machines work better—maintenance costs go down.

Let's take a look at the cost of clean air. The AAF Electro-PL installation shown here is a good example. The Electro-PL is a dry-type, electronic air filter of high efficiency . . . with special design features that simplify maintenance. It was selected by Upson-Walton for two reasons: reasonable cost, and performance characteristics that met their special requirements. The Electro-PL is exceptionally versatile in application, as it is available in units for Straight Bank or "V" arrangement to meet almost any space, capacity or cost requirement.

Electro-PL is only one of many types of air cleaning products manufactured by AAF. If you want a correct and economical answer to these questions • How much *clean* air do I need? • How *clean?* • How much will it cost? . . . call your nearby AAF representative or write direct to us.

AAF American Air Filter COMPANY, INC.

373 Central Ave., Louisville 8, Kentucky • In Canada: Darling Brothers, Ltd., Montreal, P. Q.

Our plant stood in 10 feet of water

but here's where we stand today:

Here, you see our Ultralite insulation plant as you would have seen it from the air on July 15. Yet just 10 days later, we were shipping Ultralite glass fiber insulation out of undamaged inventory. And in another 14 days, Ultralite insulation was rolling off the assembly line again.

Production is rapidly approaching normal. Soon, very soon, a second Ultralite factory will go into full production — a huge, ultra-modern plant started long before the flood to help satisfy the demand for Ultralite. Soon, combined production in the two plants will make Ultralite more readily available than it has ever been before!

Already, protective measures for the future have been endorsed by the authorities, and plans have been completed. Higher, stronger dikes and levees will be built — dikes so much stronger than ever before that Gustin-Bacon is resuming production with full confidence that a similar disaster can never occur again.

GUSTIN-BACON MFG. COMPANY
CENTENNIAL BLDG. KANSAS CITY, MO.

New York Chicago Philadelphia San Francisco Los Angeles
Houston Tulsa Fort Worth

67 Ultralite Distributors throughout the country have stocks available to fill your insulation needs. Consult the yellow pages of your telephone directory.

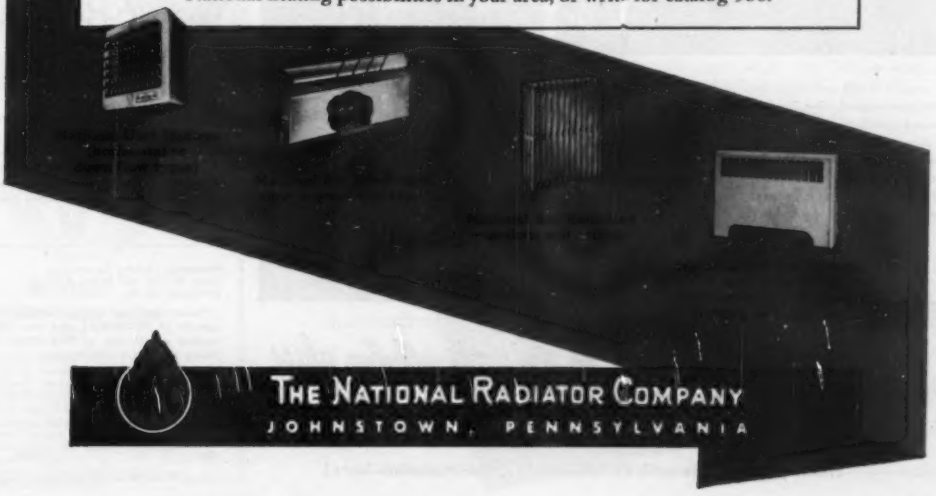
July 14: Flood water reaches the Ultralite insulation plant.

EASIER, FASTER, PROFITABLE BUSINESS WITH THE COMPLETE LINE OF NATIONAL HEATING PRODUCTS

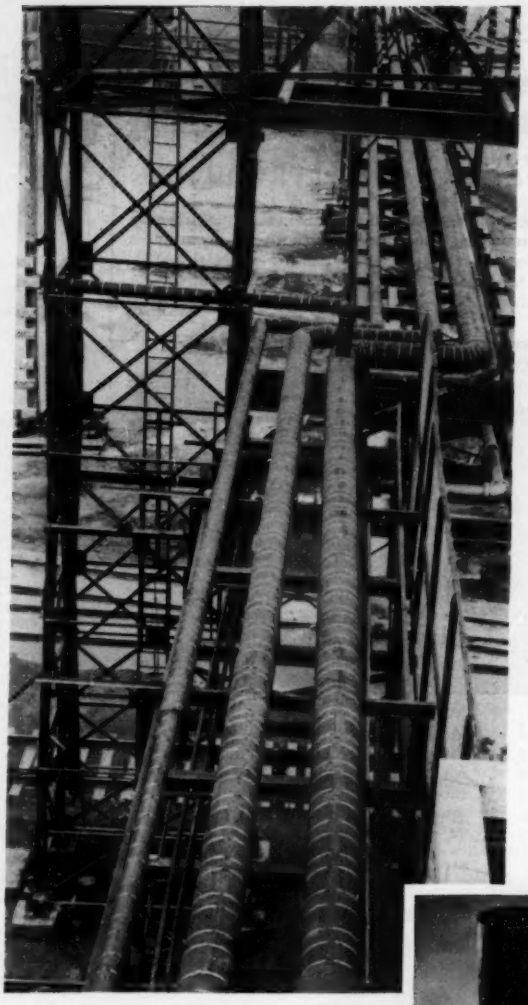
National Heating Products place you in an advantageous position to meet every heating need under any condition with promptness and satisfaction. The distinguished complete family of National Heating Products, well known everywhere, is consistently advertised and enjoys ready acceptance.

National complete hot water and steam heating systems include highly efficient convertible cast iron Heat Extractors and steel boilers adaptable to coal, gas and oil firing. They are equally effective with every modern type of NATIONAL heat distributor and heating accessory for complete installations in diner, motel or small home to the largest apartment, hotel, school, hospital or commercial building.

For satisfactory, substantial, reputation-building business it pays to handle and install National Heating Products. Contact your nearest National representative for further information on the National heating possibilities in your area, or write for catalog 586.



THE NATIONAL RADIATOR COMPANY
JOHNSTOWN, PENNSYLVANIA



WHICH PIPE NEEDS FOAMGLAS MOST?

● As these fuel oil and steam lines at the Warners, N. J. Plant of American Cyanamid Company must be kept at temperatures of 190° to 390° Fahrenheit, they *all* have a big need for their factory-wrapped FOAMGLAS.

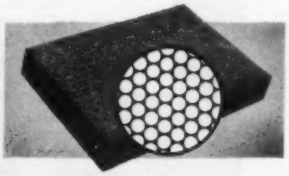
FOAMGLAS — indoors or outdoors — insulates equally well from below zero temperatures to 800°F. It retains its effectiveness. It's light, rigid, durable.

For use on pipe lines of standard sizes, FOAMGLAS is available in two types, "Regular" and "Factory-wrapped." The latter—covered with a glass cloth membrane—is most widely used for temperatures from 212°F. to 800°F., but also can be used for cold applications.

Get the latest information about FOAMGLAS for piping, valves and fittings, tanks and towers, heat exchangers, evaporators and other process equipment. Write for sample and free copy of booklet.

PITTSBURGH CORNING CORPORATION
PITTSBURGH 22, PA.

Factory-wrapped pipe insulation comes with a ready-made finish that may be painted if desired. The FOAMGLAS sections are placed on the pipe, wired or banded, and the flaps then cemented over the longitudinal and end joints respectively. Piping and fitting insulation is fabricated to close tolerances to insure close fit with the equipment and to provide full thickness of insulation. ▶



The *best* glass insulation is cellular glass. The *only* cellular glass insulation is FOAMGLAS. This unique material is composed of still air, sealed in minute glass cells. It is light weight, incombustible, verminproof. It has unusually high resistance to moisture, chemicals and other elements that cause insulation to deteriorate.

PITTSBURGH PC CORNING

FOAMGLAS® *the cellular glass insulation*

When you insulate with FOAMGLAS . . . the insulation lasts!

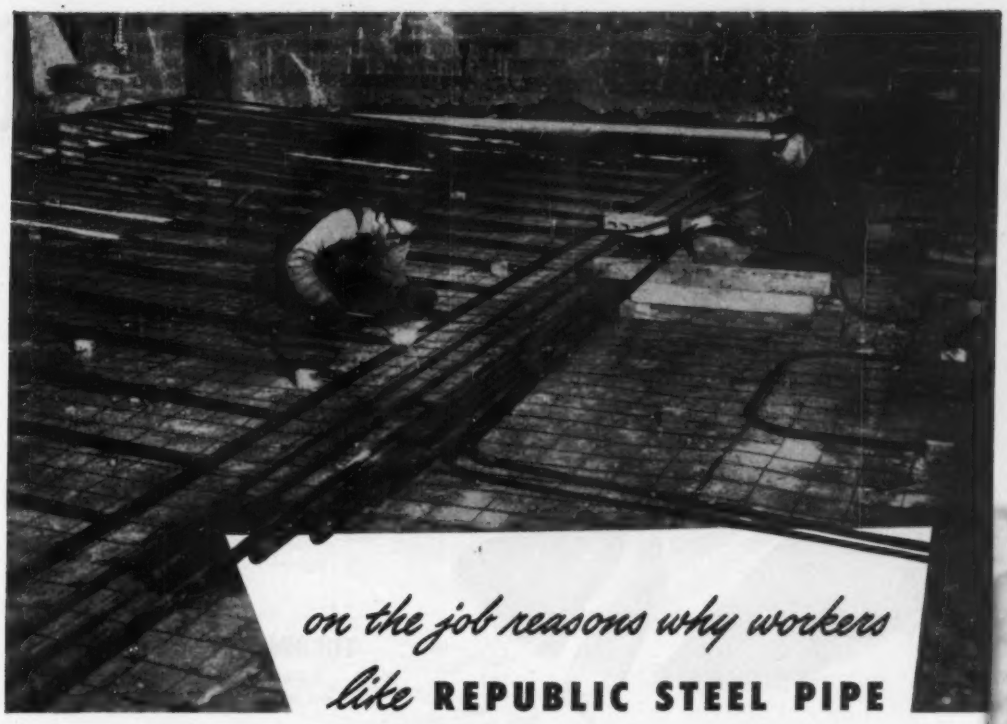
Pittsburgh Corning Corporation
Dept. AF-101, 307 Fourth Avenue
Pittsburgh 22, Pa.

Please send me without obligation, a sample of FOAMGLAS and your FREE booklet on the use of FOAMGLAS for Piping and Process Equipment.

Name.....

Address.....

City.....State.....



on the job reasons why workers like **REPUBLIC STEEL PIPE FOR RADIANT HEATING**

Our Lady of Peace Catholic Church, Cleveland, Ohio. Sweeney and Wise Co., heating contractor. Stickle, Kelly and Stickle, architects.

● For many years, steel pipe has been standard for closed heating systems. It has done its job well, giving long, trouble-free service. Its record proves you need nothing more costly than Republic Steel Pipe for today's closed radiant heating systems.

Made by Republic's own advanced Continuous Weld Process, it is highly ductile, easy to fabricate, especially suited to close coiling and bending. It rates a warm welcome by the men who fabricate and install radiant panels.

For example, the men who worked on this big church heating job fabricated of Republic Steel Pipe like its easy bending.

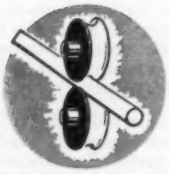
They like the way it takes a weld.

They have had no trouble with welds failing to hold.

They're not afraid of accidentially damaging this rugged pipe.

Why not check with your jobber now about Republic Steel Pipe for the radiant heating jobs you've lined up for later in the year? It's not a bit too early to let him know your future needs.

REPUBLIC STEEL CORPORATION
GENERAL OFFICES • CLEVELAND 1, OHIO
Export Dept.: Chrysler Bldg., New York 17, N.Y.



REPUBLIC CONTINUOUS WELD PIPE

Uniformly Strong
Uniformly Ductile
Uniformly Clean and Scale Free
Easy to Weld by All Modern Methods
Easy to Bend, Thread and Close Coil
Economical Uniform Lengths, Extra Long Lengths
Uniform Wall Thickness, Diameter, Concentricity
Expansion Co-efficient Same as Concrete and Plaster

"For today and for the future..."

THEODORE E. MUELLER
President, American Radiator
and Standard Sanitary Company

"For today and for the future; for yourself and for your country; the Payroll Savings Plan is a thoroughly American plan. By helping ourselves through savings we maintain and extend individual independence and help our country preserve its freedom. Thousands at American-Standard are carrying forward this sound American tradition of national-help through self-help."

". . . national-help through self-help"—that's the Payroll Savings Plan!

Introduced in 1941 and offered to millions of employees by alert managements, the Payroll Savings Plan has given employed men and women an easy, automatic way to build financial independence, save for a home, educate their children and gain many benefits that can be acquired only by thrift. It has built up a tremendous reserve of purchasing power: today, Americans hold more than $58 billion in U. S. Savings Bonds. It has helped to provide cash to retire maturing Savings Bond issues and pay off $6 billion in bankheld debt. It is one of our strongest checks on inflationary tendencies.

In these critical days, when "Defense is Everybody's Job" the Payroll Savings Plan is up front with America's defenders. Month after month, in upwards of 21,000 companies, more than 8,000,000 men and women are building a bulwark of thrift dollars. In January, 1951, 3,587,000 $25 Defense Bonds and 1,028,000 $50 Defense Bonds were purchased—the majority by serious savers on the Payroll Savings Plan.

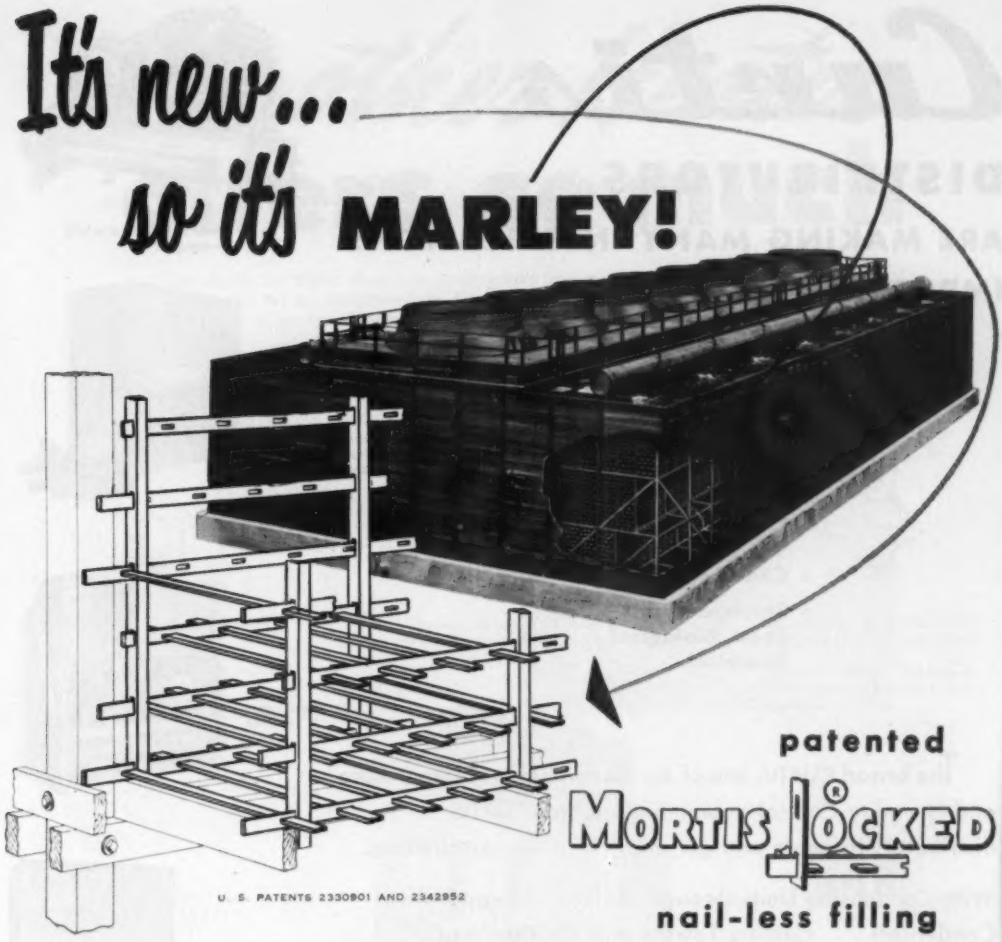
Management is doing its part—in a big way. Hundreds of companies, large and small, are reinstating the Payroll Savings Plan or vitalizing the existing plan by a person-to-person canvass that puts a Payroll Savings Application Blank in the hands of every employee. No pressure is exerted—or needed. In Mr. Mueller's American-Standard plants, for example, the person-to-person canvass added 7,800 more employees to the plan that protects.

If your company does not have a Payroll Savings Plan . . . or if you have not made a person-to-person canvass recently . . . phone, wire or write to Savings Bond Division, U. S. Treasury Department, Suite 700, Washington Building, Washington, D. C. Your State Director will be glad to help you.

The U. S. Government does not pay for this advertising. The Treasury Department thanks, for their patriotic donation, the Advertising Council and

Heating, Piping and Air Conditioning

It's new... so it's MARLEY!



U. S. PATENTS 2330901 AND 2342952

patented

MORTISLOCKED

nail-less filling

. . . THE COOLING TOWER FILLING THAT BREATHES

. . . has long been an important factor in making Marley Double-Flow the world's leading water cooling tower. Now it's redesigned for even greater ruggedness, more long-lasting stability.

And it retains its ability to expand and contract with every variation of temperature and moisture.

Design simplicity is the keynote of MortisLocked filling . . . no nails, bolts or spacer blocks are needed. There are no parts to rust, corrode or fall out. Bulletin ML-51 graphically portrays MortisLocked superiority . . . write for it now.

producers of
DOUBLE FLOW TOWERS
DRICOOLERS
AQUATOWERS
NATURAL DRAFT TOWERS
CONVENTIONAL TOWERS
SPRAY NOZZLES
VAIRFLO TOWERS

MARLEY

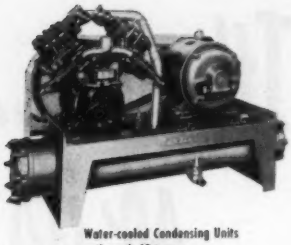
The Marley Company, Inc.

KANSAS CITY 15, KANSAS

Curtis

DISTRIBUTORS

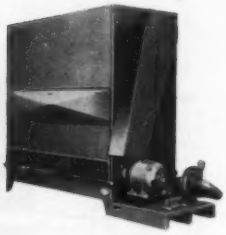
ARE MAKING MANY INSTALLATIONS IMPORTANT TO DEFENSE



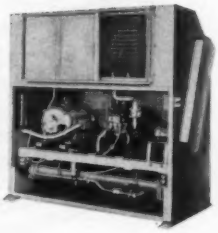
Water-cooled Condensing Units —through 40 tons

in

- Army, Navy, Air Force Projects,
- Industrial Processing,
- Research Laboratories,
- Commissaries,
- Storage Plants—Food, Biological, Chemical



Evaporative Condensers, Cooling Towers and Air Handling Units to match



Central Type— 10-15 ton

The broad CURTIS line of Air Conditioning, Temperature and Humidity Control equipment enables CURTIS distributors to *quote* and *get* many of these installations.

With Condensing Units through 40 HP . . . Evaporative Condensers . . . Cooling Towers and Air Handling Units to match, CURTIS distributors can handle *more jobs*, make *greater profits*.

Package Type— 2-4-6-8 ton

Some Franchises are Open. Pin this coupon to letterhead and mail for complete information

BOOTH NUMBERS
431-435-436-442

Curtis REFRIGERATION AIR CONDITIONING COMMERCIAL

Curtis Refrigerating Machine Division
of Curtis Manufacturing Company
1950 Kienlen Avenue • St. Louis 20, Missouri

I am interested in Curtis Franchise. Send complete details.

Name.....

Street.....

City.....Zone....State.....

R51-8

97 Years of Successful Manufacturing Experience is "Built-In" Curtis Equipment

No other Heater offers so much

Yes, dollar for dollar there's no heating unit on the market that offers so many, man and money saving features as the Olson. Here are six of them — look them over and you will see six advantages you can have by installing a long life Olson.

SEPARATE DRAFT FAN

Eliminates cold blast at every start. Especially appreciated by employees.

MORE HEATING SURFACE FOR LONGER LIFE

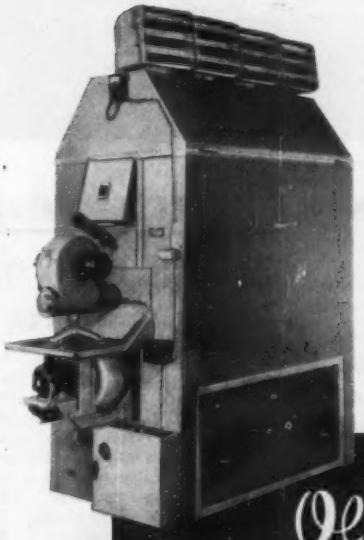
Standard 10 gauge, 4" boiler tubes give more effective heat transfer surface.

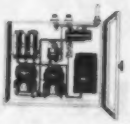
RIGID CONSTRUCTION FREE FROM VIBRATION

Low fan speed, heavy-duty shaft, large, self-aligning ball bearings.

EASY ACCESSIBILITY FOR LOW COST SERVICE

All accessories mounted on outside. Can be serviced without dismantling.





DUST-TIGHT, DAMP-PROOF CONTROL BOX

Within sight and reach of all burner adjustments. Control circuit 110 v/t.

ALL POPULAR PARTS— EASILY AVAILABLE ANYWHERE, ANYTIME

All standard products of nationally known manufacturers.

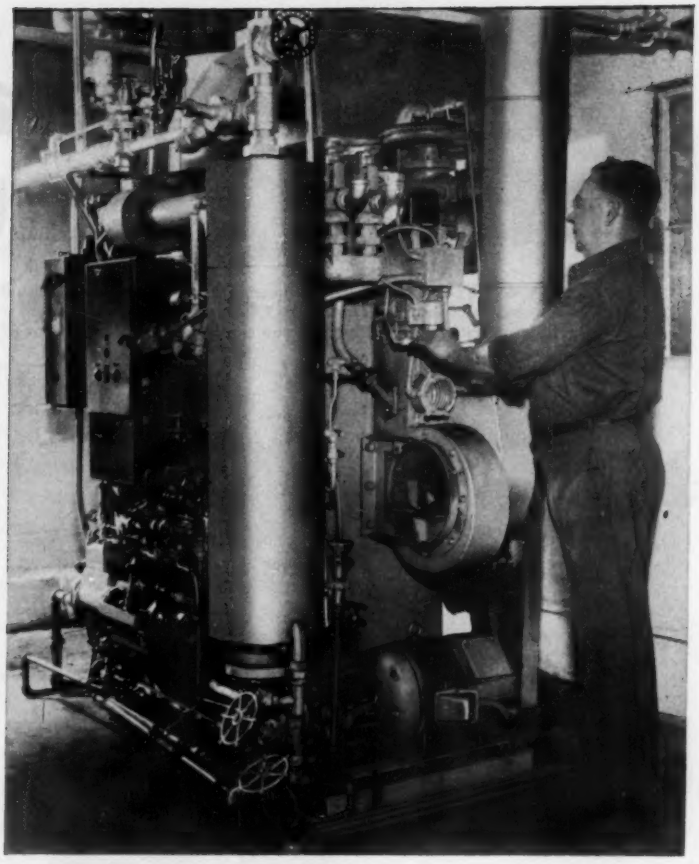
Olson

ARTHUR A. OLSON & CO.

Gas, Oil, Coal or Dual Gas and Oil

BROAD ST. - CANFIELD, OHIO

WRITE *for Bulletin and engineering data sheet showing horizontal and inverted models plus other installation data and information.*



Why not—

make your steam *where you use it?*

You buy a boiler 15 or 20 feet square (or more) and just as high, and chances are you don't have room to install it very near to the places — often widely separated — where steam is to be used. So what do you do? You install, insulate and maintain expensive steam lines from the place the steam is produced to its point of use and then you continue to pay for inevitable condensation losses which can only mean higher steam costs.

Why?

Well, for one reason — some situations may make that the only practical way to do the job. *But* — in a great many instances you'll make a big saving in time, space and money by selecting the C-E Re-circulation Steam Generator — the unit that permits you to make steam *where* you *use* it.

If you have a space 7 feet square and about that high, that's all you need to set up the C-E Re-circulation Steam Generator. It's more than a "package" boiler — it's a complete steam plant including all controls and auxiliaries — a fully integrated unit — producing up to 6,000 pounds of steam per hour.

So — if you need steam . . . for continuous or intermittent load . . . for heating or processing — or both . . . for a location in your plant not now served by your existing boiler plant . . . for an occasional demand which exceeds the capacity of present boilers — if you want any or all of these, plus the advantages of maximum output from minimum space, then your best bet is the C-E Re-circulation Steam Generator. Don't buy any boiler in its capacity range until you investigate C-E.

C-E

COMBUSTION ENGINEERING — SUPERHEATER, INC.

200 Madison Avenue, New York 16, N. Y. B-523

Standard is always first with the finest

here it is...
the floor register everyone wants!

STANDARD'S NEW

PERIMETER FLOOR REGISTER

with Standard's exclusive

Dialamatic Control

Standard's new, exclusive dialamatic control gives you POSITIVE HEAT CONTROL. The set screw arrangement means easy balancing, trouble-free operation!

SPECIFICATIONS

The blades of model PH-142 are fabricated of 16 gauge steel, the blades are set in a fixed-fan angle degree for even deflection. The Frame is of one piece, 18 gauge steel construction. The Louvre box fabricated of 16 gauge steel. Packed one to a box, and 20 to a master carton. Comes handsomely finished in gleaming, durable metallic-lustre finish.

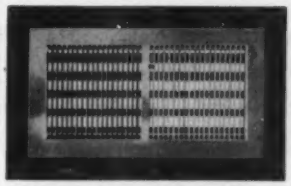
Duct opening	Overall of Louvre Box	Overall of Face	Open Area	Depth of Box
2¼" x 14"	2⅛" x 13¾"	3¾" x 15⅛"	80%	2⅛"

THE NEW, IMPROVED

multiple valve

REGISTER

Has Horizontal Multiple Valve Louvres, and 3/16" turned down edge for flush sidewall installation. The attached sponge rubber gaskets are an *extra* feature that prevents escape of air and chipping of wall surface. The Louvres are adjustable so that the flow of air may be directed either downward, straight forward, upward, or to complete shut-off.



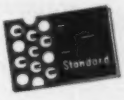
MODEL NO. 331

Metallic Finish standard finish on this style

Write now for Standard's Free Pocket Catalogue

MEMBER NATIONAL WARM AIR HEATING AND AIR CONDITIONING ASSOCIATION — INDOOR COMFORT

write now!



No cost or obligation to you

Gentlemen: Please send me your new pocket catalogue at no cost to me.

NAME_____

ADDRESS_____ CITY_____ ZONE_____ STATE_____

COMPANY NAME_____

Standard Stamping and Perforating Co.

3151 West 49th Place—Chicago 32, Illinois

SAFEWAY chooses the BEST WAY

to Comfort-Condition its Newest Supermarket . . .

See Our Exhibit at NAFF PIER - Chicago

7th ALL INDUSTRY REFRIGERATION AND AIR CONDITIONING EXPOSITION

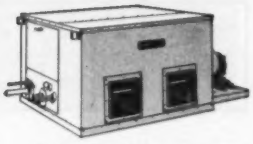
Latest addition to the Safeway Store chain—one of Washington, D. C.'s most modern (and comfortable) shopping centers.

Marlo Cooling Equipment

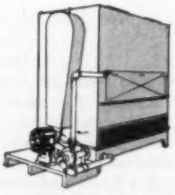
This ultra-modern Safeway Store in Washington, D. C., has selected Marlo equipment to meet its cooling needs . . . and to assure complete customer comfort.

With good reason, too! . . . Since Marlo cooling equipment has already proved its superior quality in efficiency, economy and consistent performance *in 24 other Safeway Store installations.*

Write for information on the complete Marlo line.



AIR CONDITIONING UNITS—one of two such units for supplying the Safeway's entire shopping area with complete summer-winter functions: cooling, heating, ventilating, filtering.



EVAPORATIVE CONDENSER — 25 ton capacity . . . designed to assure maximum water savings . . . quiet, durable, compact for long-life service.

Marlo MANUFACTURERS OF

COIL CO. • 6135 Manchester Rd. • St. Louis 10, Mo.

COOLING TOWERS • EVAPORATIVE CONDENSERS • INDUSTRIAL COOLERS
AIR CONDITIONING UNITS • MULTI-ZONE UNITS • BLAST HEATING & COOLING COILS

KENNEDY bronze gate valves...

JOB-FITTED for low-cost maintenance

TO ASSURE DEPENDABLE OPERATION with minimum maintenance, the complete KENNEDY Line is *job-fitted* . . . every valve specially designed and engineered for the job it has to do.

THE SIMPLE, STURDY DESIGN of the rugged KENNEDY Fig. 27 Bronze Gate Valve, for example, eliminates the small, quick-wearing parts that can cause frequent repair expenses.

EXTRA TIGHTNESS, without undue wear on the packing, is assured by an unusually deep stuffing box. Stripping of the stem and disc threads is practically impossible. Ribs cast on inside of valve body fit into channels in disc to maintain straight-line operation of all moving parts.

THE STUFFING BOX is provided with gland, and the valve can be repacked under pressure when wide open.

SCREWED BONNET AND WEDGE DISC are standard on the Fig. 27 in sizes from ¼ to 3 inches. Larger sizes are constructed with bolted bonnets and cam-type double discs with parallel seats. Working pressures ¼" thru 3" 125 lbs. Steam, 200 lbs. WOG, non-shock. 3½" thru 6" 100 lbs. Steam, 150 WOG, non-shock.

TO SAVE TIME AND TROUBLE, the Fig. 27 is *job-fitted* for easier installation, too. Wide, heavy pipe-end hexes have generous chamfer and precision threading . . . help you make tight connections quickly and easily.

FOR BEST RESULTS and real economy, standardize on KENNEDY Bronze Valves . . . and the complete line of KENNEDY Iron Valves, Malleable, Cast-Iron and Bronze Pipe Fittings.

KENNEDY FIG. 27, Bronze Gate Valve
125 lbs. steam, 200 lbs. WOG, non-shock

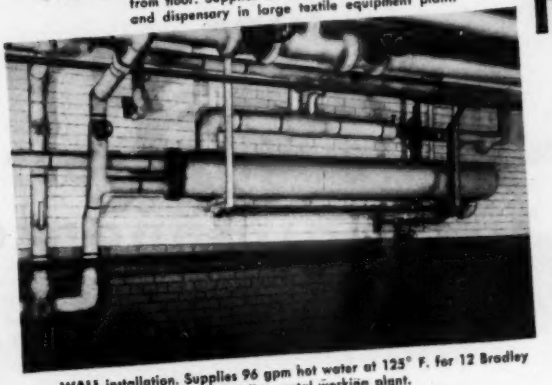
WRITE FOR CIRCULAR 102
BUY FROM YOUR LOCAL DISTRIBUTOR

KENNEDY JOB-FITTED VALVES

THE KENNEDY VALVE MFG. CO.
ELMIRA, NEW YORK

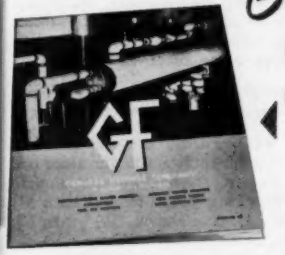
VALVES · PIPE FITTINGS · FIRE HYDRANTS

OVERHEAD installation of GENERAL Instantaneous Heater. 12 feet from floor. Supplies all hot water for washroom, cafeteria and dispensary in large textile equipment plant.



WALL installation. Supplies 96 gpm hot water at 125° F. for 12 Bradley wash fountains in leading metal working plant.

More efficient Hot-Water Supply *that needs no floor space!*



Get NEW COMPLETE CATALOG 60!

This 12 page catalog is packed with profitable ideas for industrial plants. Describes complete GENERAL line: instantaneous water heaters, converters, coil heated tanks, and other equipment.

Complete sizing data, steam consumption tables, photographs and diagrams are included to simplify selection and installation.

SEND NOW!

General Fittings Co.
Dept. A., 123 Georgia Ave., Providence 5, R. I.

Please send me your new, complete Catalog No. 60 of industrial water heating equipment.

Name .....

Street .....

City ..... State .....

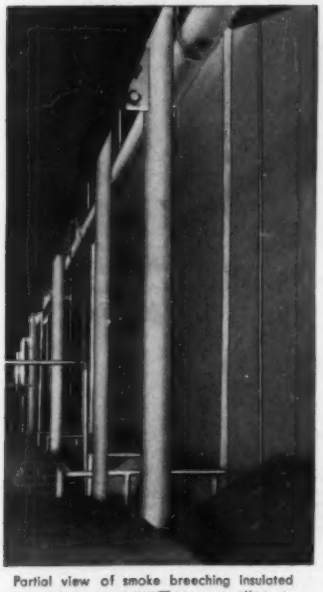
Wherever space is available — near the ceiling, on the wall, in a corner — that's where you can install GENERAL Instantaneous Heaters. You don't have to crowd your boiler room, or subtract from valuable production area.

The many advantages of these compact water heaters are especially important today in helping you meet increased hot water requirements at minimum cost. There's no bulky tank, no excavation, no complicated piping. You save money on both installation and operation. Water is heated instantly and continuously by steam supplied through shell.

GENERAL Instantaneous Heaters are available in 21 sizes with capacities to 300 gals. per minute. Mail coupon today for complete information.

Boiler room of Buffalo State Hospital, Buffalo, N. Y. All boilers, heated equipment, and steam lines are insulated with "Featherweight" 85% Magnesia. Cold water pipes insulated with K&M Duplex.

More than four and one-half miles of steam lines



Partial view of smoke breeching insulated with "Featherweight" 85% Magnesia 3" blocks and finished with Asbestos cement.

OWNER: State of New York
ARCHITECT: Cornelius J. White, State Architect
GENERAL CONTRACTOR: The John W. Cowper Co., Buffalo, N. Y.
HEATING CONTRACTOR: Quackenbush Company, Buffalo, N. Y.
INSULATION CONTRACTOR: E. J. Eddy, Inc., Buffalo, N. Y.

—insulated with "FEATHERWEIGHT"® 85% MAGNESIA

From the new boiler house of the Buffalo State Hospital, 24,000 lineal feet of piping carry steam throughout the institution. And, to guard against heat losses, the entire system—pipes, boilers, smoke breeching, and other heated surfaces—is insulated with "Featherweight" 85% Magnesia.

"Featherweight" 85% Magnesia provides efficient, durable insulation at a cost that insures savings. And the savings are continuous: "Featherweight" will last the life of your heating system!

Keasbey & Mattison "Featherweight" 85% Magnesia Insulation is made in blocks, laggings, and standard-size pipe coverings for all applications up to 600° F. Other K&M Insulations cover service ranges from 40° F. to 1900° F. Our local distributor, who is an experienced applicator, will be glad to give you complete information. Or, write us.

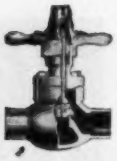
Nature made Asbestos . . .

Keasbey & Mattison has made it serve mankind since 1873

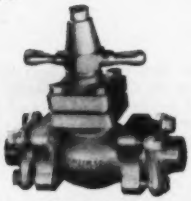
KEASBEY & MATTISON
COMPANY • AMBLER • PENNSYLVANIA

PACKLESS VALVE
With balanced-action

AMMONIA VALVE
Bolted Bonnet — screw or flanged connections. Also with screwed bonnet, sizes 1" and under



WING CAP VALVE
Non-ferrous



WING CAP VALVE
Semi-steel—with companion flanges and adapters

HENRY VALVE CO
CONTROLLING FLOW

You pay—

no premium for..

the extra advantages found in

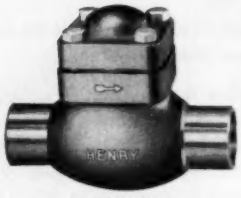
Henry products

...for the extra satisfaction that follows their use

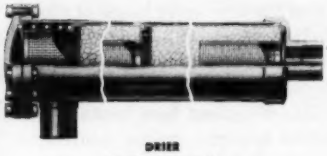
STRAINER
Angle type with patented distortion-proof flange

Y-STRAINER
Brass plated. Welded steel construction with forged brass connections. Size ⅜" O. D. S. through 4⅛" O. D. S.

BALANCED-ACTION PACKLESS LIQUID LEVEL GAUGES
Valves are backseating—diaphragms may be inspected or replaced without loss of liquid. Conforms with all safety code requirements.



CHECK VALVE
Piston Type For Freon. Sizes ⅜" through 4⅛" O.D.S.



DRIER
Cartridge type with dispersion tube

EXTRA CAPACITY DRIER
2 cubic inches more than established practice. Forged brass end caps.

. . . Write for these catalogs

No. 100 Packless and packed valves, strainers, driers, ammonia valves, check valves, relief valves, three-way valves, scale traps, liquid gauge sets, flange unions, nut unions and accessories for air conditioning and refrigeration and industrial uses.

No. 70 Drop forged and cold rolled steel fittings.

DIAPHRAGM RELIEF VALVE
Large capacity—fast positive relief and reseating action. Very small differential between opening and closing pressures.

STRAIGHT-THROUGH RELIEF VALVE
Large capacity—All Brass Construction. Sizes ¼" M.P.T. through 1" F.P.T.

Stocked and Sold by Leading Jobbers

VALVES • DRIERS • STRAINERS • CONTROL DEVICES and ACCESSORIES FOR REFRIGERATION and AIR CONDITIONING and INDUSTRIAL APPLICATIONS

HENRY VALVE COMPANY

MELROSE PARK, ILLINOIS Chicago Suburb • Cable: HEVALCO, MELROSE PARK, ILLINOIS

HITS A HIGH NOTE IN PERFORMANCE

The secret of *outstanding* symphony performance can be traced to the skill of the conductor. The talent of each individual musician must be coordinated with all the others for perfect balance and exact timing.

In the design and manufacture of Emerson-Electric Motors, there is no secret reason for their *outstanding* performance. Specifications require that each component part be soundly constructed, and that all the parts must operate together, harmoniously, to give efficient, exacting service.

Many of America's leading appliances and products are powered with Emerson-Electric Motors. Their manufacturers have discovered that the smooth operation of Emerson-Electric Motors is an *outstanding* factor in building sales. Your inquiry for full information, without obligation, is invited. Write today.

Write for these Emerson-Electric Motor Data Bulletins

Appliance and equipment manufacturers, with applications for motors of 1/20 to 5 h.p., can profitably use these reference guides. Specifications, construction and performance data are included for these motors:

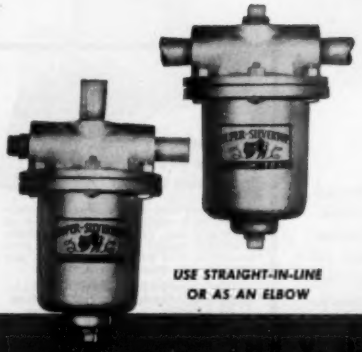
- ☐ 169-A Capacitor-Start
- ☐ 169-B Split-Phase
- ☐ 169-C Integral
- ☐ 169-D Fan-Duty
- ☐ 169-E Oil-Burner
- ☐ 169-F Jet Pump
- ☐ 169-G Blower

THE EMERSON ELECTRIC MFG. CO., St. Louis 21, Mo. 22

EMERSON ELECTRIC
MOTORS • FANS — APPLIANCES

there's nothing wrong with this unit heater that a SUPER-SILVERTOP CAN'T CURE

Many unit heater inefficiencies are blamed on the unit itself when the real trouble lies in the trapping. Super-Silvertop Steam Traps put heat back in your unit heater. The heat delivery or B.T.U. output of your unit heaters depends, among other things, on how completely the steam compartment or core is filled with dry hot steam. Also, the faster the unit heater is brought up to temperature, the sooner it begins to operate at a maximum efficiency. By venting air and draining condensate rapidly, Super-Silvertops permit the core to be completely filled with hot dry steam. Super-Silvertops work when other traps fail because they're activated by water only regardless of temperature. Presence of water, hot or cold, causes the trap to discharge. Be prepared for winter, equip your unit heaters with Super-Silvertop Steam Traps now. See your nearest representative or distributor, or write us direct.



USE STRAIGHT-IN-LINE OR AS AN ELBOW

HOW TO SELECT STEAM TRAPS FOR UNIT HEATERS

Anderson's booklet, "Solving Steam Trap Problems" tells engineers and contractors how to select proper sized steam traps for unit heaters of various capacities. Write for your free copy today.

Make Steam the Low-cost Way

Coal-Flow Stoker
Transfer mechanism in coal conveyor tube permits bin-feed installations in boiler room layouts where this type of operation was formerly impossible.

Pneumatic Spreader Stoker
Dries, pre-heats, conveys, fires low cost coals. Highly responsive. Up to 1,000 boiler h.p. per nozzle.

Rotary Oil Burner
Fires low-cost No. 6 oils or lighter with complete steadiness at varying oil temperatures. To 500 boiler horsepower.

Commercial Gas Burner
Vertical type (above). Also Radiant Inshot and Ring types. Flexible operation, easily installed. To 400 boiler horsepower.

Can you afford to waste what Iron Fireman users are saving?

Iron Fireman stokers cut steam costs two ways:

1. Less coal. Clean, efficient fire gets more heat from coal. Automatic control of firing rate keeps fire adjusted to steam requirements at all times. No wasteful lag or over-run, even with extreme fluctuation of the boiler load.

2. Lower handling costs. Coal automatically fed direct from main coal bunker. Conveyor fits almost any boiler room layout. No driving mechanism inside coal bunker.

Mail coupon for more information, or call nearest Iron Fireman dealer for complete survey of your boiler plant. You assume no cost or obligation.

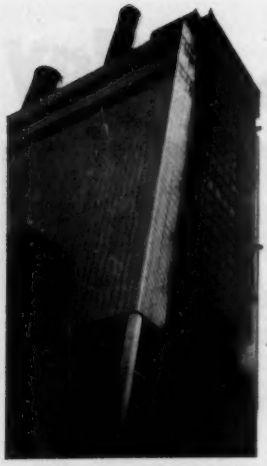
IRON FIREMAN

IRON FIREMAN MFG. CO., 3158 W. 106th St., Cleveland 11, Ohio.
Please send literature as checked:

- ☐ Coal-Flow Stoker
- ☐ Pneumatic Spreader Stoker
- ☐ Rotary Oil Burner
- ☐ Commercial Gas Burner

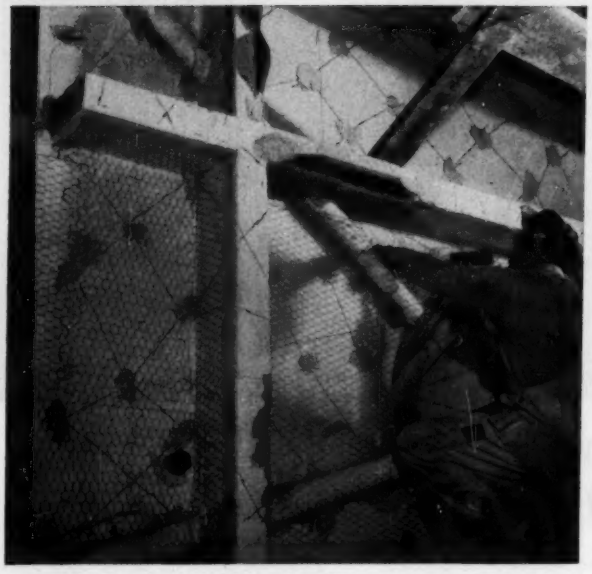
Let Iron Fireman engineers help decide which fuel is best for *your* plant.

Name_____
Address_____
City_____ State_____



Keeping Pace With Modern Boiler Design...

One Material Insulates The Entire Job–Better



New boiler installation by Babcock & Wilcox Company, an extension of Toledo Edison Company's Acme Plant, has a rated steam output of 650,000 lb. per hr. at a design pressure of 1500 psi. and 1000° F. temperature. The new boiler is the largest in northwestern Ohio.

Kaylo Heat Insulation—the first basic advancement in the insulating industry in many years—is a hydrous calcium silicate. This remarkable inorganic material (not glass) provides a combination of far-reaching advantages.

With its wide effective temperature range—up to 1200°F.—Kaylo Heat Insulation eliminates the need for combination coverings in nearly all operating conditions. It retains its efficiency and dimensional stability in long service.

Kaylo Heat Insulation is insoluble in water. Its high strength practically eliminates spoilage both in transit and in application. Workmen can walk on insulated equipment without breakage. Yet along with its high strength Kaylo Heat Insulation is light in weight, making it easy to handle and apply.

For complete details on Kaylo Heat Insulation, write Dept. N-199, Owens-Illinois Glass Company, Kaylo Division, Toledo 1, Ohio.

KAYLO HEAT INSULATING BLOCK is made in all standard sizes, up to 18" wide and in thicknesses from 1" to 6". Where necessary, on special order, the block can be shiplapped for broken joint, single-layer application in thicknesses of 3" or greater.

KAYLO PIPE INSULATION is made to Simplified Dimensional Standards of thicknesses and diameters for snug nesting, when needed. Coverings are sectional for tube and pipe sizes ¼" to 12"; tri-segmental up to 23"; quad-segmental up to 41"; K-segmental (18" wide segments) up to 72" in diameter.

KAYLO® **... first in calcium silicate**

SEND OUT CATALOG In

...pioneered by OWENS ILLINOIS Glass Company

MAIN OFFICE: TOLEDO 1, OHIO—KAYLO SALES OFFICES: ATLANTA • BOSTON • BUFFALO • CHICAGO • CINCINNATI • CLEVELAND DETROIT • HOUSTON • MINNEAPOLIS • NEW YORK • OKLAHOMA CITY • PHILADELPHIA • PITTSBURGH • ST. LOUIS • WASHINGTON

They do good turns by the thousands with EASY-FLO and SIL-FOS

For over 20 years EASY-FLO and SIL-FOS have been favorites in the Refrigeration Industry, particularly for joining pipe and tubing. That's because these low-temperature silver brazing alloys consistently produce *strong, permanently leak-tight joints,* and do it *at top speed and bottom costs.*

So it is not surprising to find the Betz Corp., Hammond, Indiana—a leading manufacturer of cooling and refrigerating coils—using these alloys. They make a wide variety of coils, all formed of heavy-wall seamless copper tubing—and they braze all return bends with EASY-FLO while miscellaneous connections are joined with SIL-FOS.

Photos show the return bends on two different types of coils being brazed with EASY-FLO. If you could see how fast these operators go down a stack of coils you would appreciate what a high-production tool EASY-FLO can be, even when hand fed. Also, the joints need no finishing because EASY-FLO is so exceptionally free-flowing practically all of it goes *into* the joint area.

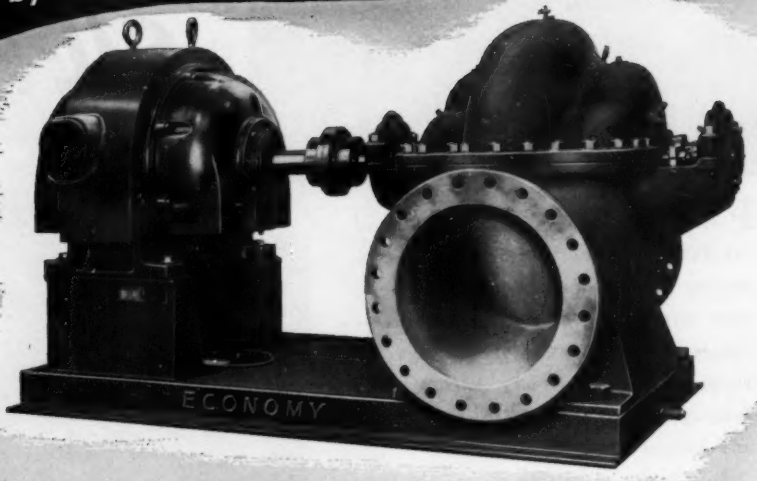
IF YOU NEED LEAK-TIGHT JOINTS that will never work loose or need attention, *there's no simpler, faster, more economical way to get them* than with EASY-FLO and SIL-FOS. *BULLETIN 20* will tell you *why* and *how.* Write for a copy today.

HANDY & HARMAN
FOUNDED 1867
QUALITY · SERVICE

HANDY & HARMAN
82 FULTON STREET · NEW YORK 38, N. Y.
Bridgeport, Conn. · Chicago, Ill. · Los Angeles, Cal. · Providence, R. I. · Toronto, Canada
Agents in Principal Cities

when it's pumps, think of Economy

backed by over thirty years of specialized experience



The Type M Single Stage Double Suction Pump illustrated is just one of the many in the extensive line manufactured by Economy Pumps, Inc. This exceptionally rugged design is available in capacities from 50 to 30,000 gallons per minute at heads to 300 feet. A general purpose pump, it is ideally suited to general water supply or heavy mill service.

Maintenance expense is held to a minimum. Case records show Economy Pumps operating for fifteen to twenty years without replacement of major parts. However, should repairs be necessary, all parts subject to wear are renewable.

Economy Pumps are tested in accordance with the standards of the Hydraulic Institute and the A. S. M. E. under conditions duplicating as nearly as possible those encountered in actual service.

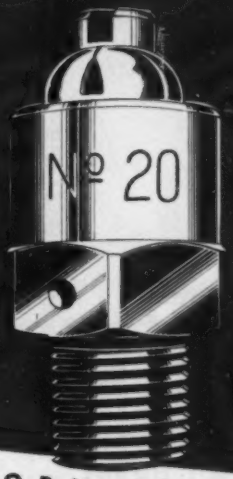
Catalog No. A750 gives complete design and construction details, also some interesting typical examples of performance, as well as handy selection tables. Write Dept. C-10 for your copy.

Economy Pumps Inc.

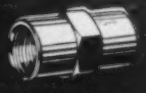
DIVISION OF HAMILTON-THOMAS CORP., SEDGLEY AVENUE at 19th and LEHIGH, PHILADELPHIA 32, PENNSYLVANIA

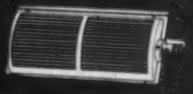
Same Goal

No. 20

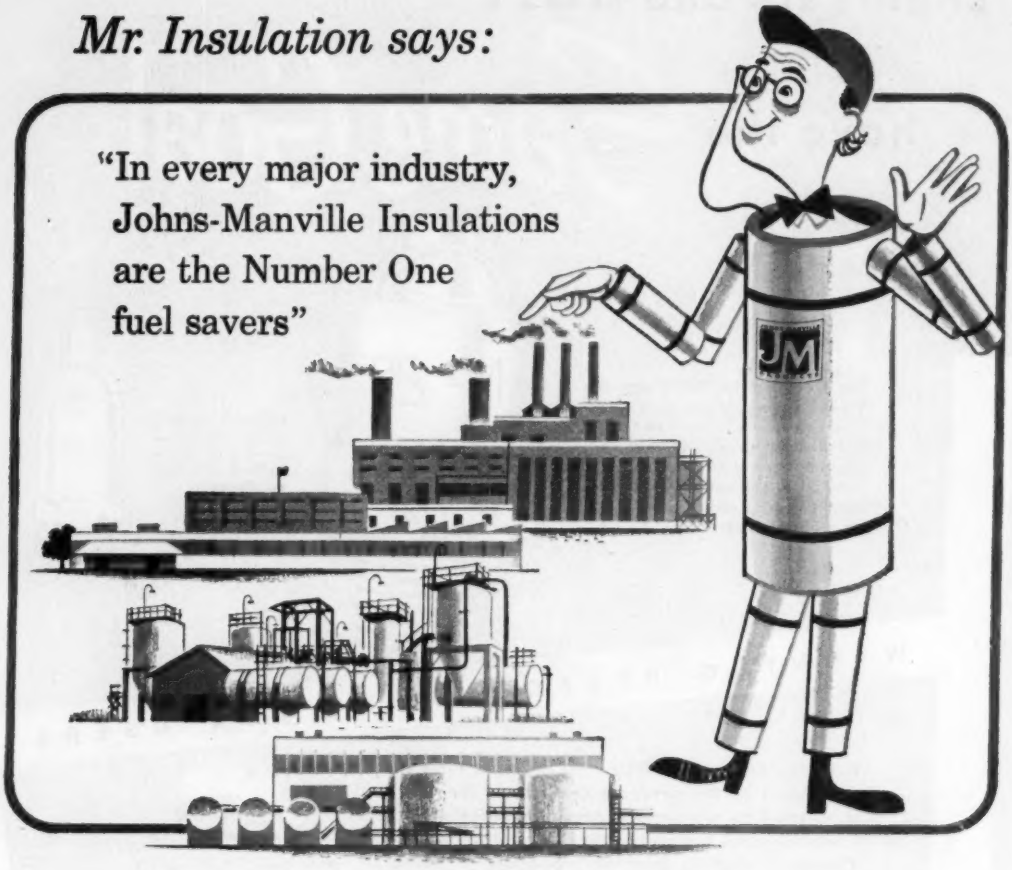


WINNING PERFORMANCE FOR USERS





Mr. Insulation says:



IN PLANTS with stacks or stills, tanks or towers, the story is the same—"Insulation by Johns-Manville" means the maximum return on your investment. There are two good reasons for this:

1. YOU GET THE RIGHT *MATERIALS*—From asbestos and other selected raw materials, Johns-Manville manufactures a wide range of industrial insulations for service from 400F below zero to 3000F above. If you need engineering advice in determining exactly the right one for your job, you can get experienced and authoritative assistance from your local Johns-Manville insulation engineer.

2. YOU GET THE RIGHT *APPLICATION*—Even correctly selected insulation needs proper application to permit it to serve at peak efficiency through the years. Here you can always count on J-M Insulation Contractors and their highly skilled mechanics. These organizations are trained in Johns-Manville application methods, and have generations of insulation experience behind them.

Why not get the complete picture? Call on insulation headquarters when your next job is in the planning stage. Just write Johns-Manville, Box 290, New York 16, N. Y.

Johns-Manville *first in* **INSULATIONS**

FAR-AIR Self-Washing Filter

Cure for a Dirty Shakedown

Twice each day it was necessary for a large Eastern steel producer* to shakedown his furnaces. This caused high concentrations of dirt which resulted in severe air filter maintenance and inefficient air conditioning.

FARR Company, when called upon for a permanent solution, recommended a FAR-AIR** Self-Washing Filter. This proposal was approved and an installation made. After two years of use, the results are very satisfactory; the dirt problem is solved and another unit has been installed in the same plant.

The reason for the success of the FAR-AIR Self-Washing unit in this case (in addition to the extremely high efficiency of the FAR-AIR filters) was the fact that the unit could be set to *automatically* wash and re-oil itself just prior to the time that the furnaces were shaken down. Thus, maintenance was virtually eliminated and the filters were always at peak efficiency.

FAR-AIR Self-Washing Filters can be furnished to handle any CFM requirement. If you have an air filtration problem, Farr engineers will be glad to help you find the proper solution. There is a FAR-AIR product to meet most filtering needs. Write for complete information to Farr Company, P.O. Box 10187 Airport Station, Los Angeles 45, California.

Other FAR-AIR products include standard commercial and industrial panel filters, marine filters, rotary coolers, grease eliminators, filter maintenance equipment. Also, special filters for special applications.

*Name furnished on request.

**Trade Mark Registered

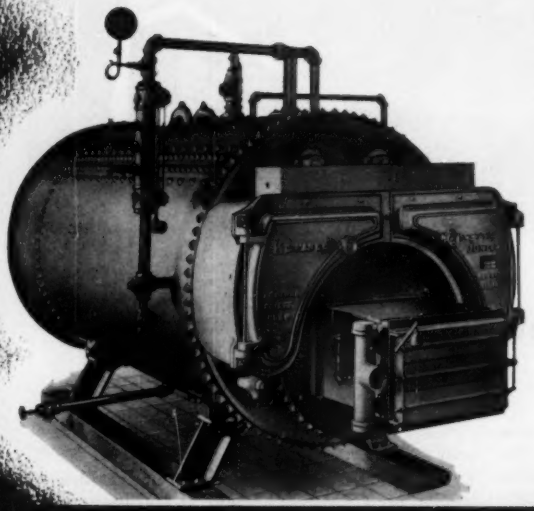
FARR COMPANY *Manufacturing Engineers*

Los Angeles · Chicago · New York

Mf'd under license by Control Equipment Co. Ltd., Montreal, Canada

NOW FIRE ALL 3

● SCOTCH MARINE, CAST IRON and STEEL HEATING and POWER BOILERS



Scotch Marine type boilers, air heaters and any other type of "cold" furnace can be fired by natural gas at higher ratings. The Webster Kinetic Burner is easy to install, compact and economical to operate. It fires with extremely low pressure gas without noise, vibration or electric power and with minimum furnace draft.

WEBSTER KINETIC* BURNER

(LOW PRESSURE GAS)

The Webster Kinetic consists of a multiplicity of full venturi mixers with flame retention nozzles. These are assembled in a metal casing complete with pilot and louvre. It may be used with natural, mixed or liquefied petroleum gases. Standby oil burners may be used when desired.

As a multiple head assembly it is available in 25 standard sizes of from 4 heads to 48 heads, and can be supplied in any size or shape. Natural gas input ratings from 560,000 Btu/hr to 6,720,000 Btu/hr at 4" wc.

For complete information request Series B8 Bulletins.

*TRADEMARK

Kinetic assembly illustrated is No. 27. Requiring plate opening of only 8½" high and 28½" wide.

The WEBSTER ENGINEERING COMPANY

TULSA, OKLAHOMA

Division of SURFACE COMBUSTION CORPORATION, Toledo, Ohio

IT ALWAYS PAYS TO SPECIFY

LADISH

Controlled Quality

PIPE FITTINGS

TO MARK PROGRESS

...you get full value for every fittings dollar

THE COMPLETE *Controlled Quality* FITTINGS LINE
PRODUCED UNDER ONE ROOF...ONE RESPONSIBILITY

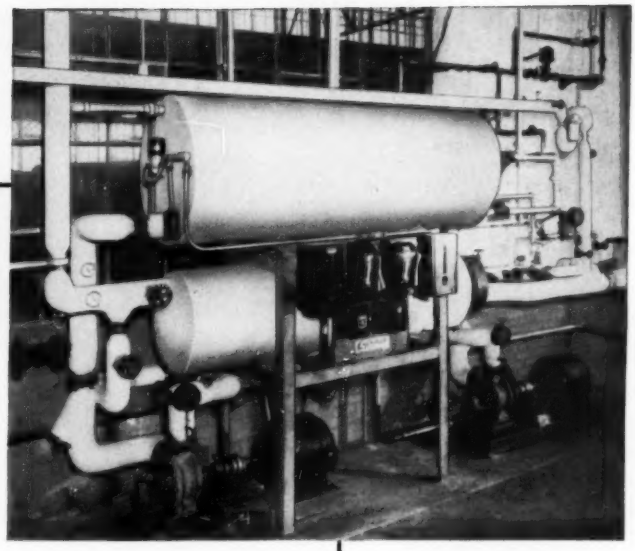
LADISH CO.

CUDAHY, WISCONSIN
MILWAUKEE SUBURB

District Offices: New York • Buffalo • Pittsburgh • Philadelphia • Cleveland • Chicago • St. Paul
St. Louis • Atlanta • Houston • Tulsa • Los Angeles • Havana • Toronto • Mexico City

The more critically you appraise value... the more you will appreciate Ladish Controlled Quality Fittings. For the ultimate economy of Ladish Fittings is assured by laboratory, engineering and manufacturing controls unsurpassed for thoroughness and rigid standards. From metallurgy through machining ... repeated tests safeguard the extra strength and soundness vital to long dependable service ... extra value you can always depend on from Ladish Controlled Quality Fittings.

SCHAUB
BOILER RETURN SYSTEMS

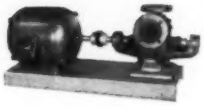


A duplex SSK-D Schaub deaerating type Boiler Return System in modern Chicago industrial plant. Equipment includes Model 2084 feed water heat exchanger, and serves a 200 HP, 200-lb. W. P. boiler.

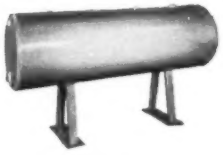
You Get All These Features ...in a SCHAUB

Only Schaub offers you the combined exclusive *money-saving* features illustrated at the right. Any one of these alone would be a sound reason for buying a Schaub System over any other. Take time to compare details. Then you'll quickly see why Schaub gives you *more* for your money on *every* feature. In terms of real savings—you get improved operating economy, lower maintenance costs and longer equipment life. All this means your return system costs you less per year. Know the facts and you'll readily recognize that a Schaub Boiler Return System is your best value.

Get the Facts! The complete story of how much more you get when you specify a Schaub System is quickly presented in Catalog 55. Write for your copy NOW—it's free!



Schaub Master-Bilt Turbine Pump
Patented floximatic shaft seals and pre-lubricated ball bearings mean no packing and no greasing—ever! When you install a Schaub Master-Bilt Pump, you can forget about it.



Chromosoid-Lined Receiver
10-year guarantee against corrosion. Schaub engineers developed Chromosoid lining by working with leading chemical researchers. You're protected from costly and premature replacements. No more rust-clogged systems!

Ultra-Dependable MAGNETROL Boiler Water Level Control
Combination pump-control and low water safety cut-off. Friction-free Magnetrol, assures boiler safety. No bellows to stiffen, no packing in head, no tricky electrode circuits to fail. All models approved by Underwriters' Laboratories, Inc.

FRED H. SCHAUB ENGINEERING CO.

2116 S. Marshall Boulevard • Chicago 23, Illinois

But your rooms seem larger!

Yes, Radiant Heating makes rooms larger

Americans like "room to stretch!" So, no matter how modest a home, or how limited by budgetary considerations, our *desire* for "elbow room" and a feeling of spaciousness is as strong today as it ever was.

The chances of getting it are good, too, thanks to the ingenuity of modern architects, builders, and manufacturers, who have incorporated dozens of space-saving and space-making ideas into modern home design.

One of these, radiant panel heating, in addition to providing healthful automatic heat, actually *makes* interiors *larger* by installation of the heating units within floors, walls and ceilings.

Steel pipe is first choice for this modern "invisible heat." For steel pipe has all the qualities of formability, weldability, durability, and economy required for successful radiant panel systems. Proved in conventional hot water and steam systems for more than 60 years, steel pipe brings to this latest method of heating, an established, time-honored quality of pipe service fundamental to efficient operation.

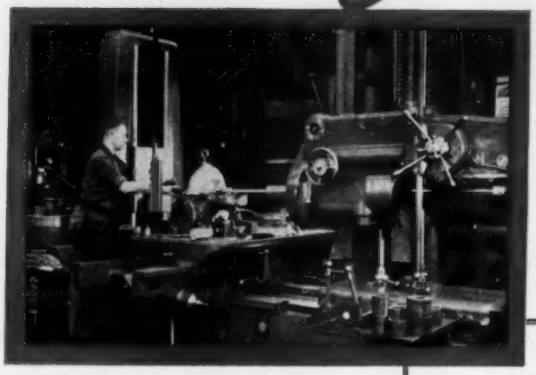
Write for a copy. A free 48-page color booklet "Radiant Panel Heating with Steel Pipe"

Steel Pipe is First Choice

COMMITTEE ON STEEL PIPE RESEARCH
AMERICAN IRON AND STEEL INSTITUTE
350 Fifth Avenue, New York 1, N.Y.

Fine Machine Work

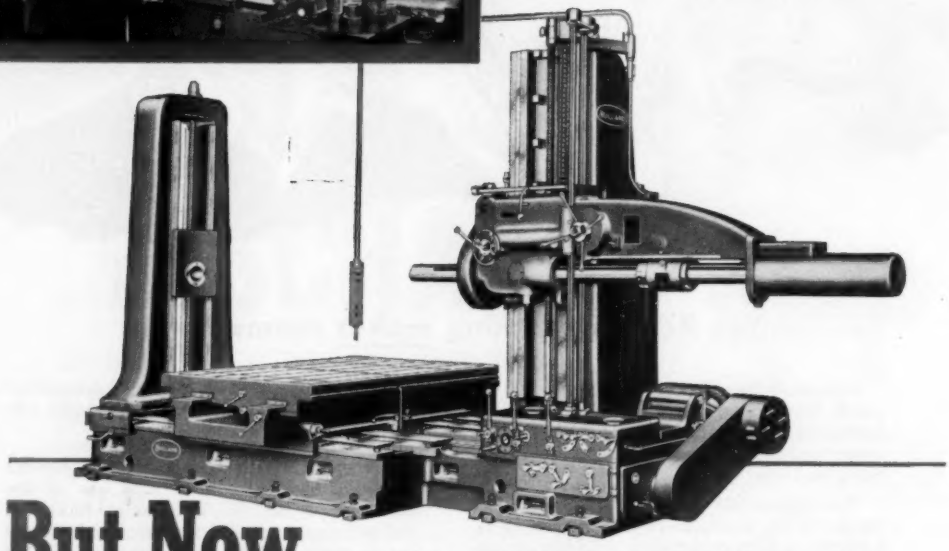
"Decides the Quality of a Pump"



. . says
Warren Steam Pump Co.
of Warren, Mass.

testimonial enough
for their five

Universal
Boring Machines

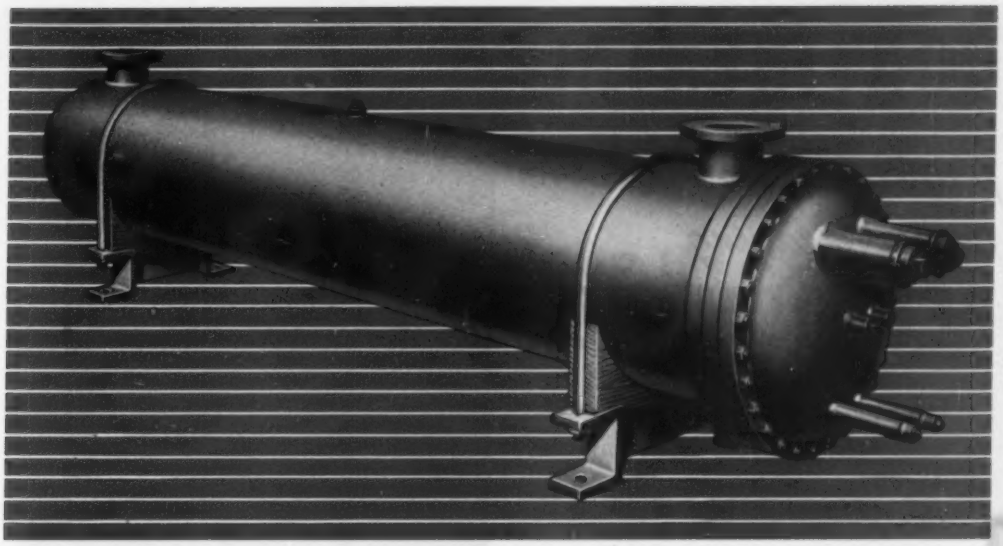


But Now... Universal Redesigned by Bullard offers a broad 4-way bed Horizontal Boring, Milling and Drilling machine with an even Higher Degree of Rigidity, Accuracy and Serviceability.

Call in a Bullard Engineer or write for complete details describing the many points of Redesign and Modernizing.

Bullardize your plant for Higher Efficiency.

THE BULLARD COMPANY
BRIDGEPORT 2, CONNECTICUT



YOU'LL WANT THE FACTS ON THIS

NEW B & G EVAPORATOR

The B & G Series "HR" Evaporator has always offered distinctive design features which mean more efficient and dependable performance. The construction, for example, which prevents oil-trapping in the head passes and assures uninterrupted oil and vapor flow.

Now, new improvements have been added which make this unit even more desirable.

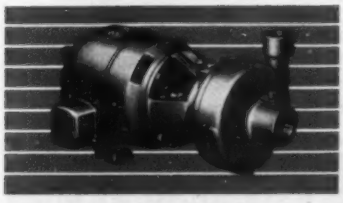
Easier to install and insulate

Note the new movable steel legs—adjustable to meet various mounting conditions. A heavy hardwood block is furnished for insertion between the shell and support legs—making the unit easier to insulate and preventing damage from condensation.

Piping is made easier, too. The shell connections extend well beyond the insulation cover—a great convenience when installing.

Built to ASME Code Requirements

B & G "HR" Evaporators are constructed according to U-69 Code of ASME regulations and are certified by Hartford Steam Boiler and Inspection Service for 150 lbs. working pressure on both Freon and water side.



B & G Series 1822 Pump
See the eight reasons why this pump is the "buy" for your cooling tower or evaporative condenser installations. Send for Bulletin CY-350.

Send for new B & G Evaporator Manual—simplified charts and tables make selection easy.

Hydro-Flo®

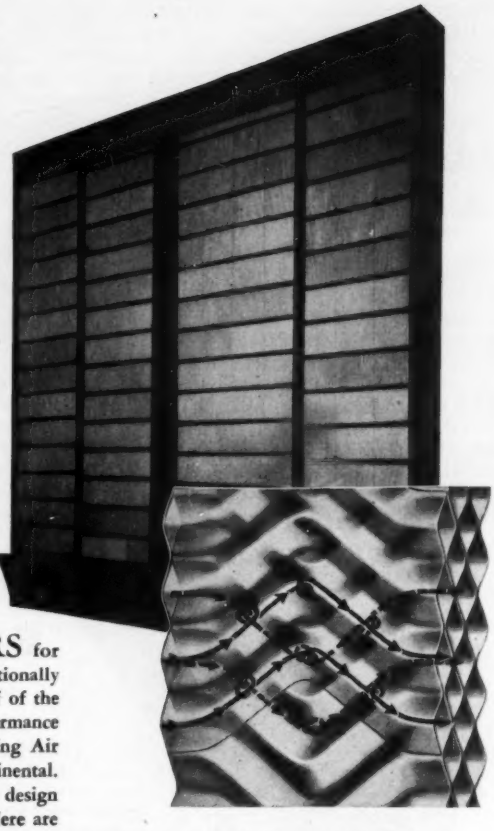
REFRIGERATION EQUIPMENT

BELL & GOSSETT COMPANY

Dept. RCF-5, Morton Grove, Illinois *Reg. U. S. Pat. Off.

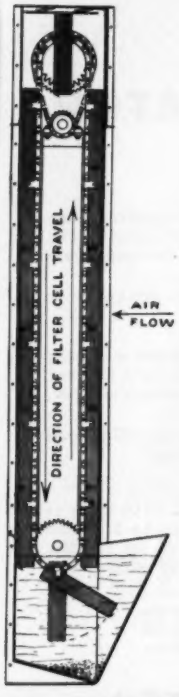
Canadian Licensee: S. A. Armstrong, Ltd., 1400 O'Connor Drive, Toronto, Canada

CONTINENTAL *proves* "TOPS" *in air-cleaning* PERFORMANCE



Independent tests by A.S.H.V.E Code Methods prove Continental Air Filters provide an exceptionally high cleaning efficiency.

Listed by Underwriters' Laboratories, Inc.



REPEAT ORDERS for Continental installations from nationally important users are the best proof of the wide acceptance and excellent performance of the new Automatic Self-Cleaning Air Filter developed and built by Continental. In just four years its revolutionary design has won nationwide admiration. Here are the reasons:

REVOLUTIONARY NEW FILTER MEDIA

Skillfully engineered honeycomb filter media (patented) has large non-clogging air passages, yet extracts air-borne dust thoroughly by splitting the airflow into 2300 separate whirling streams per square foot of filter surface. Thus it combines higher efficiency with *constant* low resistance to air flow.

FERRIS WHEEL ROTATING ACTION

Filter cells pivot like cars on a ferris wheel as they pass from the front to the back filter curtain. There is no reversal in the direction of air flow through the filter media. As a result, *dirt cannot be blown off into the clean-air stream.*

POSITIVE SELF-CLEANING ACTION

As each filter cell moves down into the oil reservoir, it soaks in a semi-horizontal position for 30 minutes or more. The cell then automatically drops to a vertical position. This patented action forces a surge of oil through the filter which effectively flushes out accumulated dust and thus *preserves the low initial resistance of the filter.*

WRITE FOR PERFORMANCE DETAILS

Before you specify or buy, ask us for complete data on this Continental Automatic Self-Cleaning Air Filter.

USE THE COUPON

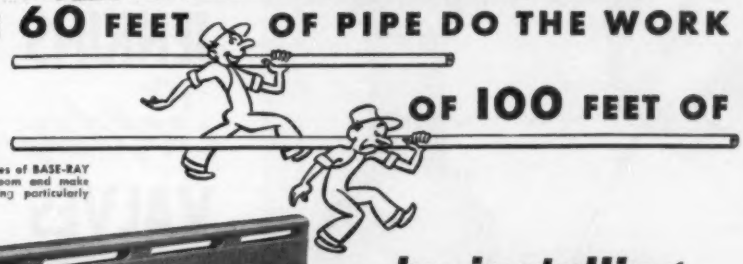
GENTLEMEN: Please send the following:
Bulletin No. 201-C ☐ Sample of Eswash Air Filter Media ☐
NAME _____
FIRM _____
STREET _____
CITY _____ STATE _____

CONTINENTAL AIR FILTERS, Inc.
P. O. BOX 1647 • LOUISVILLE 1, KY.

SAVE SCARCE PIPE

. . . up to 40%

MAKE 60 FEET OF PIPE DO THE WORK OF 100 FEET OF PIPE

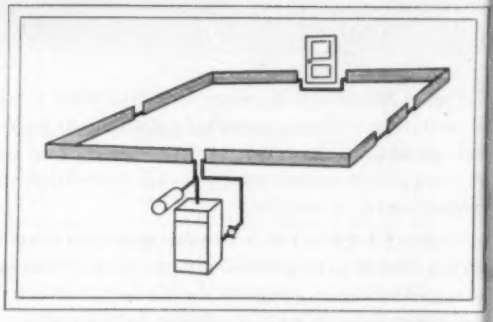


The low, sweeping lines of BASE-RAY add beauty to any room and make this method of heating particularly appealing to women.

–by installing Burnham BASE-RAY* with the Series Loop System!

In hundreds of successful installations (new homes and remodelling jobs) during the past 6 years important savings in pipe have been made. Better still big reductions in number of fittings required and in man-hours for installation have been achieved. These installations have shown too that in this system performance, efficiency, and rapid response are fully equal to the conventional one-pipe, forced circulation system. Here Burnham cast-iron BASE-RAY Radiant Baseboards become part of the main. THAT MEANS AN IMPORTANT 40% SAVING IN PIPE. It's a system that's made for this period of scarcities. It means that materials and manpower can be stretched to cover more jobs.

*Reg. U.S. Pat. Off.



The Series Loop System shown here, with BASE-RAY forming part of the main, is ideal for ranch type, basementless and two-story houses. Full details of this materials-and-labor-saving hook-up will be found on page 10 of the IBR Installation Guide No. 5.

REDUCES USE OF FITTINGS 49%

Omitting swing joints, cutting valves and other fittings to a minimum, the Series Loop means BIG Savings in material costs.

CUTS LABOR TIME 54%

Because the Series Loop requires less pipe, and fittings, piping installation time is less and makes possible this large cut in labor.

The figures cited at left compare a conventional one-pipe forced circulation system with a Series Loop System in a 1-story basementless house. Comparable savings are made in other types of houses.

BASE-RAY WEARS LIKE IRON . . . FOR IT IS MADE OF IRON

Burnham Corporation

"PIONEERS OF RADIANT BASEBOARD HEATING"

IRVINGTON, N. Y., Dept. HP-101

Dept. HP-101

BURNHAM CORPORATION, Irvington, N. Y.

Please send me folders checked below:

☐ New 6 page BASE-RAY folder ☐ BASE-RAY Ratings and Installation Guide

Name .....

Address .....

City ..... State .....

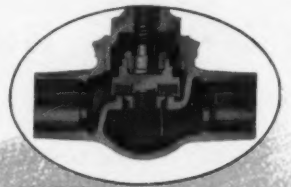
For
EASY INSTALLATION
POSITIVE CONTROL
LASTING ECONOMY
in copper line service

JENKINS *Solder-End* VALVES

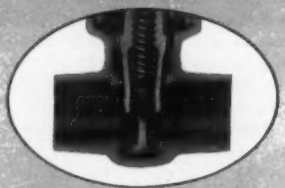
To speed installation in copper lines, you want a valve with an accurate fit to tubing—a valve that will not distort under the intense heat of soldering. And, because flexible tubing does not afford the rigid support of standard pipe, you want a valve that will withstand unusual strains in operation.

To give you Solder End Valves that meet *every* test in the toughest service Jenkins valve specialists designed them with an extra measure of rugged endurance, along with the dimensional accuracy and operating efficiency you expect in all valves of Jenkins quality.

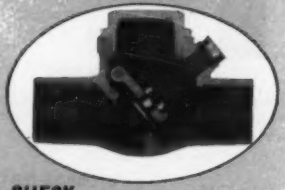
A new Folder, Form 198, describes the complete line of Jenkins Solder End Valves, shows construction details, and gives instructions for correct installation. Get your copy—see why so many economy-wise valve buyers specify *Jenkins*. Jenkins Bros., 100 Park Ave., New York 17. Jenkins Bros., Ltd., Montreal.



GLOBES 300 lbs. O.W.G. ¼" to 3" Fitted with Jenkins Renewable Composition Disc for any specified service.

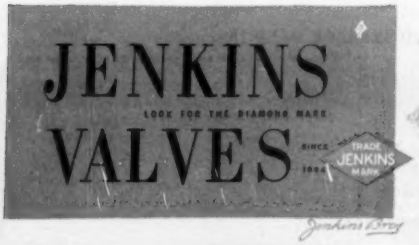


GATES 225 lbs. and 300 lbs. O.W.G. ⅜" to 3" With solid or split wedges, and stationary or traveling spindles.



CHECK 300 lbs. O.W.G. ¼" to 3" Regrinding. May be easily reground without removal from line.

GET THIS New FOLDER ON JENKINS Solder End VALVES
Gives complete description, dimensions, and instructions for installation. Ask your Jenkins Distributor or write for Form 198: Jenkins Bros., New York 17.

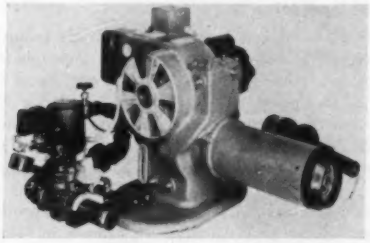


EQUIPMENT DEVELOPMENTS...

For your convenience in obtaining more information about any of this equipment, see coupon on this page. Add the new products and companies listed here to your Directory Section which you received in your January 1951 Heating, Piping & Air Conditioning and thus keep your records of sources of supply up to date throughout the year. Single asterisk indicates equipment not listed in Directory Section; double asterisk, equipment and manufacturer not listed.

Combination Gas and Oil Burners

HPAC 1—Cleaver-Brooks Co., 326 E. Keefe Ave., Milwaukee 12, has introduced a line of "Hev-E" combination oil and gas burners, in five models with a range of 720,000 to 8,700,000 maximum Btu gas burned. The



burners feature a forced air draft system which provides a single blower fan for all air for combustion. In all models, low fire start is possible with either gas or oil, and in the two larger sizes there is full modulation between high and low fire. Electronic controls are used to insure that the main gas valve cannot open unless a pilot flame is established.

Terne Coated Welded Steel Tubing for Radiant Heating

HPAC 2**—Rochester Products Div., General Motors Corp., Rochester, N.Y., is now recommending its single wall terne coated welded steel tubing for radiant heating applications. The tubing is available in both straight lengths and continuous random length coils of approximately 120 to 1000 ft (35 to 150 lb). These long coils are desirable since continuous coils can be fabricated from them with a minimum of fittings or joints. The sizes found to be most suitable for these applications are ½ in. OD x 0.035 in. wall and ⅝ in. x 0.035 in. The lead-tin alloy coating makes the tubing particularly suitable for installations where the soft solder method is used.

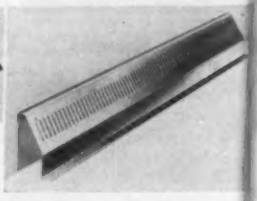
Multiple Zone Year Round Conditioner

HPAC 3—The Trane Co., La Crosse, Wis., has added two new models, one for light and one for heavy applications, to its line of multiple zone "Climate Changers," which provide year round conditioning for up to six different zones in a building. One model is rated at 1800 to 3900 cfm; the other, at 10,800 to 23,400 cfm. All models use one heating coil and one cooling coil, and each zone has its own control.

Filter-Drier for Refrigerants

HPAC 4—For applications requiring 2 and 3 hp capacities in a filter-drier of sealed construction, Sporlan Valve Co., 7525 Sussex Ave., St. Louis 17, has added the C-410 unit to its line of "Catch-All" refrigerant filter-driers. The porous core, molded of minute particles of desiccant, cannot powder or pack, nor can the refrigerant channel around or through the desiccant, the manufacturer states. The unit is available in connection sizes of ⅜, ½ and ⅝ in. SAE, and its overall length ranges from 9½ to 10¼ in., with a maximum diameter of 3½ in.

Above: Filter-Drier



Right: Register

Perimeter Baseboard Registers

HPAC 5—Standard Stamping and Perforating Co., 3151 W. 49th Place, Chicago 32, is offering two new models, C-F4 and C-F5 (illustrated), in its perimeter baseboard registers. In these registers, which are fabricated of 20 gage steel, each 4 ft section has its own individually operated sliding damper control.

FOR YOUR CONVENIENCE [10-51]

Heating, Piping & Air Conditioning
6 N. Michigan Ave., Chicago 2, Ill.

Please ask the manufacturers to send me more information about the equipment mentioned under the following reference numbers in Equipment Developments and Recent Trade Literature

(Circle each HPAC number in which you are interested)

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
101	102	103	104	105	106	107	108	109	110
111	112	113	114	115	116	117	118	119	120
121	122	123	124	125	126	127	128	129	130
131	132	133	134	135	136	137			

Name ..... Title .....

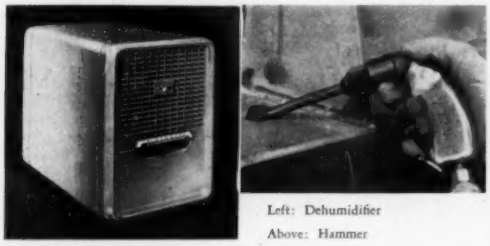
Company .....

Address .....

City ..... Zone ..... State .....

Dehumidifier

HPAC 6—For use in businesses, storage rooms, libraries, etc., Frigidaire Div., General Motors Corp., Dayton 1, Ohio, is offering its new rectangular shaped electric dehumidifier which is designed for enclosed spaces of up to 8000 cu ft. The unit, which is plugged into a 115 volt wall outlet for operation, works most effectively at room temperatures between 60 and 95 F, with a relative humidity of 50 percent or above. It is 18¼ in. high, 20½ in. long and 11¾ in. wide, and features a drawer type moisture container which holds more than 22 pints. Drain disposal also is possible. Air is drawn through a permanent filter (removable for cleaning) at a rate of 165 cfm. Both compressor and fan motor operate on a 50 or 60 cycle current.



Left: Dehumidifier
Above: Hammer

Pneumatic Hammer

HPAC 7**—Now available from The Pneumatic Tool Div., Salsbury Corp., 1161 E. Florence Ave., Los Angeles 1, is the model G-200 air hammer, a light (2 lb) hand tool for use in medium and heavy duty shop and maintenance work. Working at 120 psi, the hammer strikes up to 6000 blows per minute with maximum force, or it may be metered to any lower speed or striking power with a finger trigger. A three point ball bearing chuck locks the hammer in working position, preventing tool ejection. Offered with it are various tool kits for special applications such as welding, marine sealing, etc. The hammer illustrated is being used with a shank chisel.

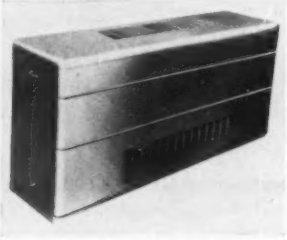
Flow Meter

HPAC 8—Minneapolis-Honeywell Regulator Co., Wayne and Windrim Aves., Philadelphia 44, is offering a differential flow meter which is available either as a mechanical flow meter with integral recorder, or as an electrical transmitter to be used with the company's inductance bridge receiver. The meter body is mounted near the flow line, and the differential pressure lines from the orifice (or other primary element) are piped into the connections provided on the meter. For electrical transmitting meters, a three-conductor cable is run between the meter body and the remotely mounted receiver. The new meter is supplied in three ranges — 53, 119.25 and 212 in. of water, and for 750 and 1500 psi SP. For dry calibration the three ranges are slightly greater.

Hot Water Generator

HPAC 9**—In the hot water generator of Aerco Corp., 214 Lafayette Place, Englewood, N. J., the thermostatic element of the temperature regulator is located in the compensator assembly. Temperature changes in the water surrounding the element are the result of a mixture of hot and cold water (inlet and outlet) created by the compensator. Changes in the temperature of this mixture affect the thermostatic element causing the regulator to modulate steam flow and maintain a constant outlet temperature. Capacities of the 30 models (at 100 psi, 100 F temperature rise) range from 4.8 to 289 gpm.

Generator



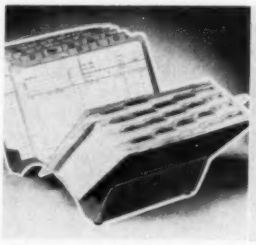
Air Conditioner

Air Conditioning Unit for Hospital Operating Rooms

HPAC 10—A hospital operating room air conditioning unit designed for use in hazardous gas atmospheres and for other special requirements has been introduced by The Trane Co., La Crosse, Wis. Provision is made for drawing 100 percent of the conditioned air from the outside, and adequate coil and humidifier capacity permits a wide latitude in the precise control of both temperature and humidity, the manufacturer states. The unit has an explosionproof (class C ether) motor and sparkproof fans, fan belts, wiring and switches. It is made in four sizes, with capacities of from 200 to 800 cfm.

Service Record System

HPAC 11—With the new "Cardineer" desk tray service record system devised by Diebold, Inc., Canton 2, Ohio, a record card may be kept for each unit serviced, each record being a history of the work done. The same card can be used for inventory control, as a sales or prospect record, etc. An automatic "V" makes each record fully readable without being removed from the file, which houses up to 810 cards.



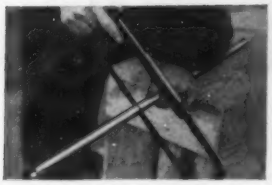
Record System

Bearing

Nylon Lined Bearing

HPAC 12*—Thomson Industries, Inc., Manhasset, N. Y., has developed the "Nylined" bearing, consisting of an outer sleeve of metal and a thin lining of Nylon bearing material (Du Pont FM 10001, which is resistant to abrasion, can withstand temperatures above 250 F and resists most industrial chemicals). The liner is retained in the

It's simple to make a good flared joint connection



1 Unroll the coil of Chase Soft Temper Copper Water Tube. Cut off needed length with hacksaw.

2 With a file or a reamer, remove all of the burs and smooth the inside edge of the tube at the opening.

3 File off the burs and smooth the outside edge. Filing and smoothing make a snug fit at the fitting.

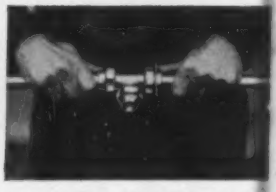
4 Slip the sleeve nut over the end of the tube. Be sure threads are toward the open end of tube.

5 Choose a flanging tool corresponding to the size of tube. Cover tool shank with oil and insert into tube.

6 Hammer the end of the flanging tool until the edge of the tube fits into the undercut of the tool.

7 After flanging, draw sleeve nut to end of tube. It is now ready to be threaded onto the fitting.

8 Put a drop of oil on the inside surface of the flange. Insert fitting into the sleeve nut and tighten it well.



9 Fit the next tube in the same way. Screw up the sleeve nut tightly so as to make a strong connection.

THE EASE of making flared joints is only one of the many advantages of Chase Copper Water Tube.

CHASE TUBE is *soft tempered* . . . easy to bend around corners or form into U-bends. You'll appreciate this Chase feature in laying underground water lines and oil lines.

CHASE COPPER WATER TUBE is excellent for replacement work, too. It comes in long lengths up to 100 ft. that can be snaked between partitions and under floors, with a minimum of disturbance to existing construction.

FREE folders give details on making flared joints and solder-joint connections with Chase Copper Water Tube.

Chase BRASS & COPPER

WATERBURY 20, CONNECTICUT • SUBSIDIARY OF KENNECOTT COPPER CORPORATION

• *The Nation's Headquarters for Brass & Copper*

CHASE 75th ANNIVERSARY 1876 1951

Albany†	Cleveland	Kansas City, Mo.	New York	San Francisco
Atlanta	Dallas	Los Angeles	Philadelphia	Seattle
Baltimore	Denver†	Milwaukee	Pittsburgh	Waterbury
Boston	Detroit	Minneapolis	Providence	
Chicago	Houston†	Newark	Rochester†	(†sales office only)
Cincinnati	Indianapolis	New Orleans	St. Louis	

Chase Brass & Copper Co., Dept. HPA 1051
Waterbury 20, Conn.

Please send me FREE Chase folders on Chase Copper Water Tube.

Name_____

Position_____

Firm_____

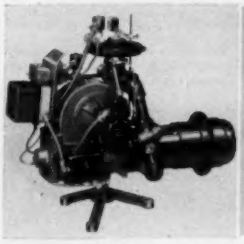
Street_____

City_____ State_____

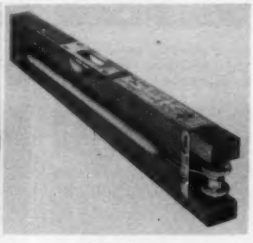
outer sleeve in a way which permits it to expand and contract circumferentially around the inner periphery of the outer sleeve. A narrow slot, or compensation gap, interrupts the circumference and takes up dimensional changes in the liner, preventing these changes from affecting the diameter. Where lubricants can be used, annular grooves are provided on the inside of the outer sleeve to form storage wells. The bearings are furnished in the plain sleeve and flange types, and they can be installed by press fit or clamping methods.

Combination Gas and Oil Burner

HPAC 13—The new MGO-2-C3 mechanical draft combination gas and oil burner of The Mettler Co. Inc., 4366 Worth St., Los Angeles 63, is a fully automatic assembly incorporating the company's spark ignited safety pilot and electronic flame failure safeguards for both fuels. Changeover is effected by an on-off switch or automatic remote control. All electronic controls are centrally mounted within the burner draft tube. The burner is packaged complete, no further control mounting being necessary exclusive of normal limit controls. Ratings are 1300 cfh for gas, 8 gph for oil.



Burner



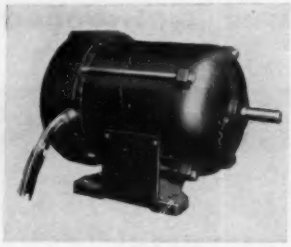
Pitch Level

Pitch Level for Pipe

HPAC 14**—The "True-Pitch" level recently developed by Dreier Bros., 7111 Bennett Ave., Chicago, is designed as an aid in getting the exact pitch of a pipe, setting that pitch, and maintaining it throughout the run of pipe. When the bubble, which can be read from top or either side, shows "level," the pipe is at proper pitch. A table on the decal attached to the device is used in figuring, setting and locking this pitch. The level is said by the manufacturer to be accurate to 1/1000 in. The device also can be used as an ordinary level if the adjustment is set at zero.

Totally Enclosed Single Phase Capacitor Motor

HPAC 15—The Small and Medium Motor Divisions, General Electric Co., Schenectady 5, N. Y., have extended the company's "Tri-Clad" line of single phase capacitor motors to include a totally enclosed fan cooled construction. The new design includes starting capacitors and a switch mounted within the frame. Available in ratings of 1, 1½, 2, 3 and 5 hp, the new motors were developed for applications where very severe conditions of dirt, grit or moisture are encountered. They may be used with coal stokers, exhaust fans, fuel pumps and similar equipment. Explosionproof and dust-explosionproof constructions also are offered. Except for the 5 hp size which uses 230 volts only, the new motors operate on a 115 or 230 volt, 60 cycle current.



Motor

Air Conditioner

Self Contained Air Conditioner

HPAC 16—A new self contained air conditioner designed to save floor space has been developed by The Trane Co., La Crosse, Wis., for use in stores, offices, apartments, factories, laboratories, etc. It is a complete packaged system requiring one electrical and three piping connections. A vibration muffling spring mounting of the compressor and glass fiber acoustic and thermal insulation of the casing contribute to quiet operation, the manufacturer states. The two knob control panel in the front of the unit cooler can be set for heating, cooling, or operation of the fan alone. The unit is available in 3, 5 and 7½ ton capacities.

Screw Anchors

HPAC 17**—The new "Scru-Tite" screw anchors of Mastercraft Products, 95-01 150th St., Jamaica 4, N.Y., are used in fastening all types of solid materials such as asphalt, brick, concrete, and metal, and for electrical conduits, piping and similar applications where screws, bolts or nails are used. The anchors are made of tenite, are corrosionproof, nonmagnetic, have low thermal conductivity, and are good electrical insulators, the manufacturer states. After a hole is drilled to size, the anchor is driven in with a hammer and the material is fastened by the insertion of the screw in the normal way. Oversize screws up to four sizes larger than their corresponding anchors can be used.

Screw Anchor

Manometer

Flexible Manometer

HPAC 18—F. W. Dwyer Mfg. Co., 317 S. Western Ave., Chicago 12, has developed a flexible manometer, made of vinyl-plastic, which can be rolled, twisted or bent. The plastic scale is held firmly between the tubes and is adjustable, the manufacturer states.

Solution to a lady's problem

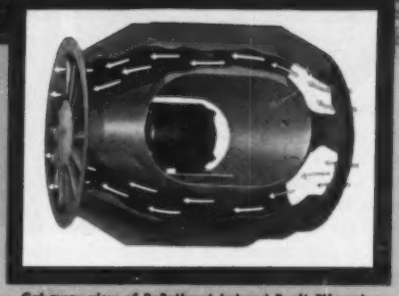
Photo courtesy
National Park Service,
U. S. Department of Interior

When officials of the National Park Service decided to install a heating system in the Statue of Liberty, they were faced with the problem of how to provide adequate draft for a boiler without marring the statue's appearance. Obviously a tall stack wouldn't do, and an added complication was the fact that inside the statue's base only a small space was available for the entire system.

The problem was neatly solved by installing a DeBothezat Induced Draft Bifurcator Fan in the horizontal breeching adjacent to the boiler. Since DeBothezat Bifurcator Fans provide positive controlled draft at all times, the statue required no stack except a stub stack three feet high. The heating system is operating at peak efficiency, keeping the half-million tourists who visit the Statue of Liberty every year as comfortable in the winter as in the summer.

Send for Bulletin

Ask your DeBothezat Fans man for the illustrated bulletin on Induced Draft Bifurcators, or write our factory, Dept. HP951.



Cut-away view of DeBothezat Induced Draft Bifurcator

How Induced Draft Bifurcator Fans Work

The Bifurcator is a direct motor-driven fan in a divided housing. The motor is in a separate asbestos-lined chamber around which the flue gasses are by-passed (bifurcated). Bifurcator Fans are extremely compact and need no platforms or supports. They install directly in stack or breeching, just like a section of duct work. Available with fan wheels from 12" through 36" in diameter, for boilers having nominal ratings up to 400 BoHP, or 56,000 EDR.

DeBOTHEZAT FANS DIVISION

American Machine and Metals, Inc., East Moline, Illinois

What supoib taste! For help with the temperature control they consulted Honeywell!

We doubt that cartoonist Larry Reynolds' character, Butch, knows the difference between a stud and a joist.

But he certainly has one mighty sound idea.

Honeywell *can* help heating engineers and contractors provide the proper thermal environment for any client – anywhere – in any kind of structure. We have a lot of well informed control engineers – in our 91 different offices – who are experienced in doing just that. And we have a lot of literature that's yours for the asking – on the automatic control of heating, ventilating and air conditioning.

So, why not *talk to Honeywell?* Why not *write to Honeywell* about *your* control problem? And why not do it *now?*

For information on how to solve heating control problems in hospitals, see the column across the page.

MINNEAPOLIS **Honeywell**

First in Controls

Radiant Heating Panels of Terne Coated Steel Tubing

HPAC 19**—Due to NPA restrictions on the use of copper, Radiant Panel Mfg. Co., 9 E. Pearl St., Torrington, Conn., is now offering some prefabricated radiant heating panels, usually composed of copper tubing, in the terne coated steel tubing of General Motors Corp. The panels are held in position by brackets which are perforated for tubes, nails and plaster grips. The brackets and clips are flush with the bottom of the tube, but the clips are designed to provide a sliding base for the contraction and expansion of the tubes, and the brackets can be moved to align with ceiling joists. Standard radius bends are 4, 6, and 9 in., but other spacing is available if desired.

Plastic Sealer for Gaskets and Threaded Joints

HPAC 20**—"Graycote," a new plastic compound for sealing gaskets and threaded joints of all types, is available from the Chicago Gasket Co., 1275 W. North Ave., Chicago 22. It is designed for oil, water, steam, gaseous fuel and refrigerant applications, for sealing gasoline, distillates, LP gases, etc., and as a general purpose sealing and anti-seize compound on mechanical equipment and in hydraulic units handling pressures up to 5000 psi. The chief ingredient is a spongy metallic pigment locked in a new type of insoluble vehicle. Retention in the non-drying vehicle keeps the compound soft, allowing units to be easily disassembled.

Metal Nameplates

HPAC 21**—A contractor can use his own metal nameplates to identify the equipment he installs and services with the "Autographs" designed and manufactured by Metalcraft, Inc., Mason City, Ia. They are individually designed and adhesive backed, and can be permanently mounted on any grease free surface, flat or curved, in a few seconds. They are lithographed in red and black ink on chrome plated metal, and are available in two sizes.

Boiler Water Treatment

HPAC 22—Water Treatment Co. of America, 1159 Hodgkiss St., Pittsburgh 12, has developed a water treatment formula, consisting of organic concentrates, for commercial and domestic heating boilers. It cleanses the heating system of collected scale and rust, and inhibits further formation. This packaged product will be sold under the "Baerite" brand name.

Condensing Air Line Filter

HPAC 23**—The new "Airlenco" compressed air line filter, which functions also as a condenser, is offered by Air-Line Engineering Co., 4758 Warner Rd., Cleveland. It has a steel outer shell 6 in. in diameter and 36 in. long, and a steel inner cartridge. Air enters the inlet opening and passes down between the inner and outer shells. Expansion of the air, and the cooling surface provided, cause moisture to condense and fall to the bottom of the outer shell where it is discharged through the drain valve. The air then passes through the Fiberglas in the inner cartridge, which baffles out the remaining moisture.

Personalized 6½" x 9" reproductions of this Larry Reynolds cartoon are available upon request.
What supoib taste! For help with the temperature control they consulted (your firm name)

For help with any control problem, talk to Honeywell!

Heating a hospital, for instance...

Here's an excellent way to help make sure the hospital you work on today will meet the demands of tomorrow: *Equip it with Honeywell Individual Room Temperature Controls.*

The trend indicates it will soon be routine medical practice to give each patient the *exact* room temperature he needs to get well fastest. This means, of course, that Individual Room Temperature Control will soon be a "must" in the modern hospital—because no other system can compensate for varying effects of wind, sun, open windows and variations in internal load.

Thus, it's just sound planning to install Honeywell Individual Room Temperature Control when a hospital is being built. Doing it later, as a modernization project, is sure to cost your client substantially more money.

For full facts about this remarkable system—and about the special Honeywell thermostat designed to meet a hospital's special needs—mail the coupon below today.

☐ Please send me complete details on Individual Room Temperature Controls for hospitals.
☐ Send a personalized reproduction of the Reynolds cartoon.

Name_____ Firm Name_____

Address_____ City_____ Zone____ State_____

Send this coupon today to Dept. HA-10-157, Minneapolis 8, Minn.

MINNEAPOLIS **Honeywell**

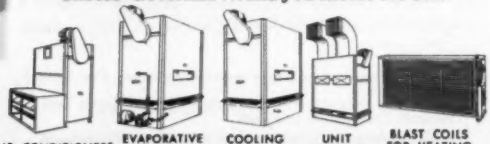
First in Controls

For day in, day out
DEPENDABILITY
you can't beat a
GOVERNAIR
COMPLETELY PACKAGED
AIR CONDITIONER

Name your job . . . any air conditioning job requiring from 3 to 50 tons . . . and you'll find that you can't beat a Governair system for day in, day out dependability.

Governair Packaged Air Conditioners are designed to operate at peak efficiency—with all parts precision-matched to work together. And they're built to give years and years of low-cost, trouble-free service.

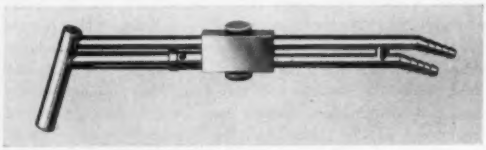
Choose Governair . . . and you choose the best!



GOVERNAIR

Soldering-Brazing Torch

HPAC 24**—A built in thumb control regulates gas and air volume in the new portable (10 oz.) soldering-brazing torch of Mass Co., 1123 W. 4½ St., Davenport, Ia. The torch, composed of brass tubing, is designed for

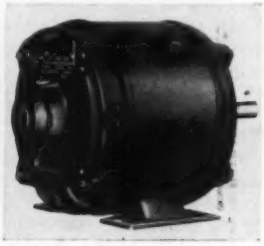


radiator work, sheet metal applications, etc. It can be used with natural, artificial or bottled gas and may be attached to an air compressor or breath blown. It is designed to produce up to 2500 degrees of heat.

Direct Reading Hygrometer

HPAC 25—The "Airguide" direct reading hygrometer of Fee and Stemwedel, Inc., 2210 Wabansia Ave., Chicago 47, used extensively by the U.S. Armed Services, is now available for general industrial use. It is designed for storage houses, testing laboratories, and similar installations.

Hygrometer



Motor

Motor with High Starting Torque

HPAC 26—The Century Electric Co., 1806 Pine St., St. Louis, is offering a new special service split phase, fractional horsepower motor with a high starting torque for applications in which a high starting current is not objectionable. The service factor is 1.00. Featured are cast iron end brackets of drip-proof design, a welded steel frame and wool yarn lubrication with reserve oil capacity. The motors can be furnished with a cushion base if necessary.

Pipe Mending Cement

HPAC 27—A new pipe mending cement, "Krak-Stik," developed by the Lake Chemical Co., 3052 W. Carroll Ave., Chicago 12, forms a seal for water, gas, acids or brine. It can be applied to pipes while water is flowing through the cracks to be mended. The cement comes in stick form, 4 in. long and 1 in. in diameter, and no heating of the pipe surface or stick is necessary.

Stud Driver

HPAC 28**—A new cartridge-powered stud driver, model 450, has been developed by Remington Arms Co., Inc., Bridgeport, Conn. The energy supplier is a 32 caliber long rim fire blank cartridge. Weighing about 5 lb, the tool can be operated comfortably by one man at a

sustained speed of five or more stud settings a minute in concrete, steel, wood, brick, asbestos siding and roofing and other structural materials, the manufacturer states. The studs used vary in length from 5/8 to 2¾ in. and are made of specially developed steel alloy.

Expanding Tube Thermostat

· HPAC 29**—The new model expanding tube thermostat developed by Smith Control & Instrument Corp., Palmyra, N.J., utilizes a stainless steel tube as the expanding member and an invar strip as the nonexpanding member. An inconel spring is used. The control point can be set at temperatures up to 600 F, and can easily be stabilized, the manufacturer states. Pulling or flexing of the leads cannot affect the contact position and leads of any desired length are supplied.

Heating System for Railway Cars

HPAC 30—A new heating system, controlled by electronic thermostats, has been developed by Minneapolis-Honeywell Regulator Co., 2641 4th Ave., S., Minneapolis 8, for railway sleeping cars. It permits passengers to select (and it automatically maintains) the temperature that suits their individual needs. Circulating hot water is used, heat being delivered to the car from floor units along each side of the wall and from an overhead system.

WE HEAR THAT . . .

ALUMINUM CO. OF AMERICA, Pittsburgh, is expanding its research facilities with the erection of a new building at the company's aluminum research laboratories in New Kensington, Pa. . . . . *GENERAL CONTROLS CO.*, Los Angeles, has purchased the assets of *GRAYSON-GREENAMYER, INC.*, of Monrovia, which will become an appliance controls division plant managed by *RICHARD GRAYSON*, who had been president of the company.

A formal opening of its new $1,250,000 plant at Duncansville, Pa., has been scheduled for October 18 by *NATIONAL RADIATOR CO.*, Johnstown, Pa. The plant probably will be producing boiler jackers, convectors, and other sheet metal products even before the dedication. The company's steel fabricating plant in Danville, Pa., purchased last year, has been sold to *THOMPSON PRODUCTS, INC.*, Cleveland, and will be used to manufacture aviation parts.

A group of 58 technicians and scientists engaged in the engineering, design and application of process and research instruments for defense needs recently completed a two week's course conducted by *BROWN INSTRUMENTS DIV., MINNEAPOLIS-HONEYWELL REGULATOR CO.*, Philadelphia. Instruction dealt mainly with application of industrial instruments to atomic research and development.

PACIFIC FITTINGS DIV., GENERAL METALS CORP., has expanded its line of malleable iron pipe fittings through the acquisition of the fittings business of

and saves customer both space and money

An ice cream freezer manufacturer* was perfectly content with the across-the-line starters used in his equipment.

But we got the idea of saving him some room and dollars by substituting Ward Leonard heavy-duty midget *relays.*

It's a really rugged relay, and certain types are Underwriters' listed as motor controllers. Months of testing proved that a standard Ward Leonard relay with just slight changes would do the job of the heavier starter.

It's another case of Ward Leonard "Result-Engineering". Write us for Bulletin 105 on the heavy-duty midget relay, or for *any* control problem, write WARD LEONARD ELECTRIC CO. 24 South Street, Mount Vernon, N. Y. Offices in principal cities of U. S. and Canada.

*Sweden Freezer Manufacturing Company, Seattle, Washington.

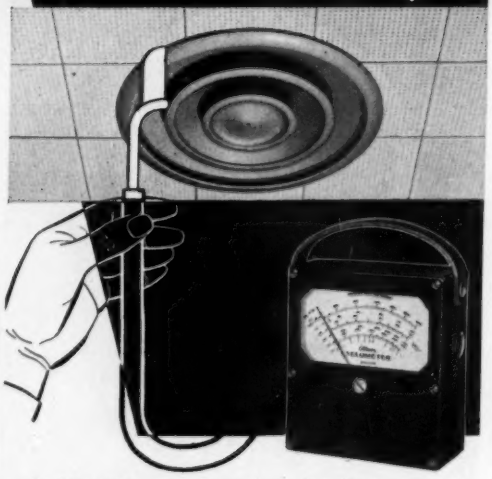
WARD LEONARD ELECTRIC COMPANY

Result Engineered Controls Since 1892

RESISTORS · RHEOSTATS · RELAYS · CONTROL DEVICES

Alnor VELOMETER

Recommended by BARBER-COLMAN *for Precision Air-Flow Readings*



Barber-Colman engineered air distribution products are designed to meet the exacting needs of architects, engineers, and owners.

Proper installation is the all-important final step that assures uniform air distribution equal to design performance.

Alnor Velometers are recommended by this manufacturer for precision air-flow readings on all installations. They have determined in their own laboratory and by field tests that the Alnor Velometer provides a fast and convenient way of checking air velocities and air-flow conditions.

The Velometer is the *only* instantaneous, direct-reading air velocity meter—accurate in all ranges, from high to low—compact, portable, easy to understand and use. Wide assortment of jets and fittings makes this precision instrument ideally suited for all velocity measurement.

For your air measurement needs—get an Alnor Velometer—you'll be glad you did. Use this coupon for quick delivery of details and prices.

ILLINOIS TESTING LABORATORIES, INC.
Room 513, 420 N. LaSalle St.
Chicago 10, Ill.
☐ Send Bulletin 3448-G.
☐ Have Alnor Representative call.

Name.....

Company.....

Address.....

City.....State.....

Alnor PRECISION INSTRUMENTS FOR EVERY INDUSTRY

PITTSBURGH VALVE & FITTINGS CORP., Barberton, Ohio. The equipment and inventory will be transferred to the division's Los Angeles and San Francisco plants.

WILLIAM J. WOOLLEY, chairman of the board, *MAID-'O-MIST, INC.*, Chicago, celebrated his 50th wedding aniversary recently. Mr. and Mrs. Woolley marked the occasion by greeting and entertaining a large group of friends and relatives who gathered from all parts of the country.

Construction under way at the Jamaica, B.W.I. bauxite deposits of *KAISER ALUMINUM & CHEMICAL CORP.* will supplement present aluminum ore sources by one million tons a year. The proximity of these reserves to the company's Baton Rouge, La., plant will reduce shipping distance to less than one-half that required by present sources.

Sales of the *ARMSTRONG CORK CO.*, Lancaster, Pa., in the first six months of 1951 reached a record six-month's high of $106,074,967, yielding net earnings after taxes of $5,283,181. The net profits, which represent a return of 5 percent on sales, compare with net profits of $6,218,796, or 7.2 percent, on a sales volume of $85,936,-210 for the first six months of 1950.

LIQUIDEPTH INDICATORS, INC., has moved to 43-22 10th St., Long Island City 1, N. Y. . . . . .A week long conference of the entire sales organization of *PENN ELECTRIC SWITCH CO.* was held recently at the main office and factory in Goshen, Ind.

REYNOLDS METALS CO., Louisville, Ky., has revised and brought up to date its 16 mm sound and color film, *Pigs and Progress*, showing aluminum production from the mining of bauxite to the final products. A new 16 mm sound and color film produced by the company, *The Shape of Things to Come*, shows how extruded aluminum parts are fabricated for pipelines and other applications.

GENERAL AMERICAN PRECOOLING, a division of *GENERAL AMERICAN TRANSPORTATION CORP.*, Los Angeles, has completed a five year contract, with a five year renewal clause, with *R. E. RISTOW*, Los Angeles, to build heat exchange equipment under the brand name of "Ristow."

J. L. MARTIN and *C. L. RAMSEY*, both of the School of Chemical Engineering, Georgia Institute of Technology, were awarded first prize of $500 in the $1,000 prize competition, conducted by *EUTECTIC WELDING ALLOYS CORP.*, Flushing, N. Y., involving papers on the use of lower melting (lower than parent) filler metals in the non-fusion welding process. Fifteen secondary prizes were awarded.

WOLVERINE TUBE DIV., CALUMET AND HECLA CONSOLIDATED COPPER CO., INC., Detroit, has completed production of a 16 mm sound and color film, *The Tube of Tomorrow*, covering the manufacturing processes employed by the company in producing seamless, non-ferrous tubing.

for

SPECIFICATION

and

BUYING INFORMATION

Use your complete, up-to-date

JANUARY DIRECTORY ISSUE

Your job will be a lot easier if you'll keep the January Directory issue of Heating, Piping & Air Conditioning constantly available for handy reference. It's one of your most valuable tools — one which will save you many hours of looking up the products you need for your various jobs. It's the ONE complete, up-to-date, readily accessible source of product information on who makes the pumps, valves, traps, compressors, specialties of all kinds, etc., you need — and where they're located. They're indentified by trade names, too. EVERY product is listed, alphabetically arranged and printed on a distinctive yellow stock for easy reading and reference.
Keep it handy . . . the time you save with it can be used to advantage in other ways.

. . . here's what other engineers and contractors have to say . . .

"Your Directory issue is an excellent buyers guide. We use it a great many times during the course of the year." *BOSTON ENGINEER*

"We find both Directory and Advertising Section helpful. The advertising gives us the product details we need." *CHICAGO CONTRACTOR*

"Your directory stays in this office until the next January issue comes along. Numerous times we refer to it." *FORT WAYNE CONTRACTOR*

"In our work, we make use of your Directory time and time again. Our reference file would not be complete without it." *LOS ANGELES ENGINEER*

REMEMBER — EVERY product is right at your fingertips

HEATING, PIPING & AIR CONDITIONING
6 North Michigan Ave. Chicago 2, Ill.

WHEN critical plant equipment must survive for an indefinite period, MUND Boilers offer you the assurance of continuous, automatic performance and trouble-free operation. You can rely on MUND Boiler equipment.

REarm your plant

FORTIFY your plant against the hazards of untimely breakdowns. Trust MUND Boilers to deliver constant, uniform power without costly maintenance or repairs. Efficient, inclined water tube design has proven its ability to withstand *hard* service. MUND Boilers are compact, self-contained . . . use gas, oil or combination burners. Built to A.S.M.E. requirements. Available in capacities of 5 to 350 HP.

WRITE FOR COMPLETE INFORMATION on your specific needs.

Ask for details about the amazing SCOTCH-MUND (3 to 30 HP.) . . . fully guaranteed to produce economical, "man-sized" power in less space.

MUND BOILERS, INC.
1600 NORTH INDIANA STREET, LOS ANGELES 33, CALIFORNIA

WHO'S WHAT

JOHN A. GILBREATH, formerly sales manager of the air conditioning division of *SERVEL, INC.*, Evansville, Ind., has been named assistant vice president in charge of the division. In addition, five new vice presidents have been named, including *JOHN K. KNIGHTON*, in charge of sales; *A. F. SCHARER*, in charge of the international division; *F. W. ORTMAN, JR.*, in charge of personnel; *S. L. NICHOLSON*, in charge of purchasing; and *RUDOLPH SCHNAKENBURG*, in charge of finance. Mr. Schnakenburg retains his post as secretary. *N. J. LITHERLAND* was named treasurer, a post relinquished by Mr. Schnakenburg, and *W. E. BAKER*, vice president in charge of manufacturing, was named to the additional post of assistant to the president. *O. J. DAIL* is now assistant vice president in charge of the commercial electric refrigeration division.

CHARLES C. BUCKLAND, who is a director and secretary of *MINNEAPOLIS-HONEYWELL REGULATOR CO.*, has been elected a vice president. He will head a newly created division which will handle activities of the aeronautical and ordnance defense programs. *GLENN SEIDEL*, who has been assistant to the vice president in charge of engineering, holds the newly created position of director of ordnance, and *STANLEY J. NELSON*, superintendent of manufacturing, will be the new superintendent of ordnance. In the aeronautical division, *E. H. SALZMAN*, formerly assistant director, is now director; *M. P. FEDDERS*, formerly works manager of the company, is the new manager of operations; and *HOWARD J. STOOPS*, most recently manager of administration, is director of manufacturing.

In another appointment, *FRED R. HAVILAND, JR.*, was named to the executive post of interpreter of marketing data for the company. Formerly, he was a senior associate with Stewart, Dougall & Associates, Inc., New York, a market research and management consulting firm.

At a recent meeting of the board of directors of *BURNHAM CORP.*, Irvington, N. Y., *VIRGIL A. GOOD* was elected vice president in charge of sales and research for the boiler division.

JOHN E. BROCK is the new director of research for *MIDWEST PIPING & SUPPLY CO., INC.* His headquarters will be the main plant and office in St. Louis. Most recently, Mr. Brock has been a consultant for the Union Electric Co. on the flexibility of steam piping systems, and for the White-Rodgers Electric Co. and the Missouri Research Laboratories on analysis of nonlinear systems. He has taught applied mechanics and mathematics at Purdue, Minnesota and Washington Universities, having attained the rank of associate professor.

The *NATIONAL PRODUCTION AUTHORITY*, U.S. Department of Commerce, has announced the membership list of the *HOT WATER & STEAM HEATING ACCESSORY MFRS. INDUSTRY ADVISORY COMMITTEE* as follows: *CLARENCE E. PULLUM*, vice president and

A unit heater for every need

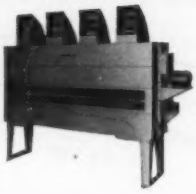
from

HERMAN NELSON

Vertical shaft propeller-fan type unit heater—*especially suited to buildings with high ceilings—up to 50 feet.*

Horizontal shaft propeller-fan type unit heater—*the most generally useful of all space heaters.*

Centrifugal-fan type unit heater—*for efficient heating and ventilating of large industrial spaces.*



De Luxe unit heater—*an attractive, quiet operating unit designed for stores, offices, churches, etc.*

Write for detailed information about any type Herman Nelson Unit Heater to:

AAF

herman nelson

HERMAN NELSON

Division of **AMERICAN AIR FILTER COMPANY, INC.**

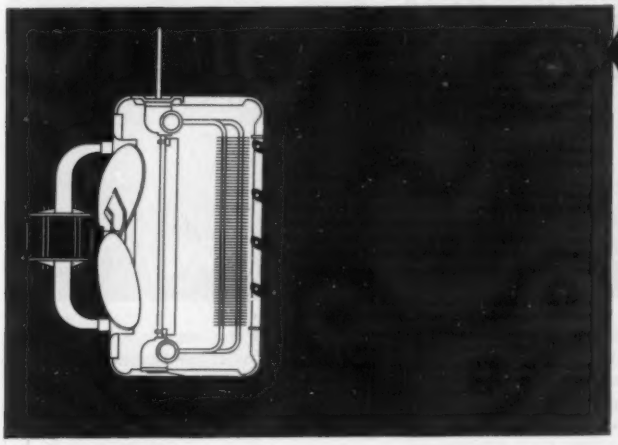
MOLINE, ILLINOIS

...FROM

HERMAN NELSON

Here is the economical, efficient solution to the heating problems of most commercial and industrial establishments. There are 18 sizes of Herman Nelson horizontal unit heaters. B.T.U. output ranges from 25,000 to 350,000 per hour. All units operate on steam or hot water. Single or two speed motors are available in either 115 or 230 volts, AC or DC.

Herman Nelson unit heaters are ahead of the field because constant engineering development and research plus functional design have earned this position—the result of 45 years of experience in the production of heating and ventilating equipment.



SUPERIOR IN *BOTH* HEATING ELEMENT AND FAN DESIGN

Herman Nelson unit heaters are suitable for the smallest service station or the largest factory. Each size unit does an extremely efficient job of heat transfer and distribution. This is because *both* heating element and fan are unique in design. Study the 10 points listed on the left and you'll see that every part has been carefully engineered to do its particular job best. The result is a highly functional and efficient unit housed in attractive, sturdy, steel cabinet, easy to install — gives years of trouble-free dependable service.

AAF herman nelson moline illinois

HERMAN NELSON

Division of **AMERICAN AIR FILTER COMPANY, INC.**

MOLINE, ILLINOIS

NOW 3 GREAT PIPE INSULATIONS

Amocel

joins Unibestos in the UNARCO line of asbestos pipe insulations

...up to 650°F.

Answering the demand for a jacketed pipe insulation for use in the lower heat ranges, UNARCO now offers Amocel — for temperatures up to 650°F. Like Unibestos, Amocel is made of Amosite asbestos fibers bonded with an inorganic binder. For pipe sizes from ½" through 12", in Standard thickness only. Light in weight. Highly efficient. Durable.

UNIBESTOS
...up to 750°F.

UNIBESTOS
...up to 1200°F.

2 GREAT PIPE INSULATIONS — Unibestos No. 750 and No. 1200 — long have been America's outstanding insulations in their respective temperature ranges. Regular production for pipe sizes from ½" through 24" in popular thicknesses through 4". Other thicknesses and sizes available on order.

We want you to have our Catalog — It gives you complete information on Amocel and Unibestos Pipe Insulations; Unibestos Insulating Block; Cements and Finishes; Flexible Insulations; Metal Mesh Blankets; Tailored-to-Fit Insulations; Asbestos Packings and Gaskets; Asbestos Textile Products . . . Just drop us a line today requesting that we send you UNARCO Catalog No. 76-109.

UNARCO

UNION ASBESTOS & RUBBER COMPANY

DEPT. 1819A • 332 SOUTH MICHIGAN AVENUE • CHICAGO 4, ILLINOIS

treasurer, Bell and Gossett Co., Morton Grove, Ill.; *J. F. LUND*, sales manager, Dole Valve Co., Chicago; *H. F. HORTON*, vice president, General Fittings Co., Providence, R.I., *NEIL D. SKINNER*, president, Hoffman Specialty Co., Indianapolis; *A. D. ROSE*, vice president, Marsh Heating Equipment Co., Skokie, Ill., *E. N. McDONNELL*, president, McDonnell and Miller, Inc., Chicago; *IRVING C. JENNINGS*, president, Nash Engineering Co., S. Norwalk, Conn.; *R. W. CUMMING*, sales manager, Sarco Co., Inc., New York; *JOSEPH R. MURPHY*, vice president, Taco Heaters, Inc., New York; *WARREN WEBSTER, JR.*, president, Warren Webster Co., Camden, N. J.; and *B. E. HORN*, president, Watts Regulator Co., Lawrence, Mass.

Also announced by the NPA was the membership list of the *EXTENDED SURFACE HEATING EQUIPMENT INDUSTRY ADVISORY COMMITTEE*, which includes: *M. NOBLE*, president, Aerofin Corp., Syracuse, N. Y.; *RICHARD H. NELSON*, vice president, Herman Nelson Division, American Air Filter Co., Inc., Moline, Ill.; *C. W. LITTLE*, sales manager, Fedders-Quigan Corp., Buffalo; *H. BLAKE THOMAS*, vice president, McQuay, Inc., Minneapolis; *A. G. DIXON*, vice president, Modine Mfg. Co., Racine, Wis.; *ALBERT J. NESBITT*, president, John J. Nesbitt, Inc., Philadelphia; *J. E. REED*, president, Sterling Radiator Co., Westfield, Mass.; *WAYNE HOOD*, vice president, The Trane Co., La Crosse, Wis.; *J. H. SMART*, sales manager, Tuttle & Bailey, Inc., New Britain, Conn.; *T. L. ARNOLD*, general manager, Vulcan Radiator Co., Hartford, Conn.; *H. S. WHELLER*, president, L. J. Wing Mfg. Co., Linden, N.J.; and *W. G. SCHLICHTING*, sales manager, Young Radiator Co., Racine, Wis.

Four new vice presidents have been elected for *ALLIS-CHALMERS MFG. CO.*, Milwaukee. *W. G. SCHOLL*, general sales manager of the tractor division, was named its vice president in charge of sales. In the general machinery division, *C. W. SCHWEERS*, director of sales, was named vice president in charge of sales; *J. F. ROBERTS*, director of engineering, is now vice president in charge of engineering; and *W. A. YOST*, formerly manager of the mechanical power department, is now a vice president of the division.

In addition, *G. F. LANGENOHL*, assistant treasurer, was elected treasurer and appointed assistant secretary. *N. D. JOHNSON*, assistant secretary, will continue in that post and assume additional responsibilities as assistant treasurer. Two new assistant comptrollers also were named. They are *E. J. DIETRICH*, assistant to the comptroller, and *T. D. LYONS*, works comptroller.

THOMAS C. KIRKWOOD is now a member of the firm of *A. C. KIRKWOOD & ASSOCIATES*, Kansas City, Mo. Founded in 1947 by A. C. Kirkwood (who is a member of HPAC's board of consulting and contributing editors), the organization has served in an engineering and consulting capacity on a wide variety of projects for both public and private clients.

CECIL HARVEY, formerly asistant to the sales manager of Gibson Electric Co., has joined the headquarters sales staff of the large motor division of *ELLIOTT CO.*,

UNARCO

Distributor of the Month

IN THE

SOUTHWEST

Trading Area

IT'S

The ABER Company

INCORPORATED

P. O. Box 1002 • HOUSTON, TEXAS

4 Engineering Offices and Warehouses

HOUSTON • SHREVEPORT • AMARILLO • TULSA

Service is the keystone of the Aber reputation covering the states of Texas, Oklahoma and part of Louisiana, Arkansas, Kansas and New Mexico. Aber provides prompt service to all classes of trade with 4 strategically located warehouses. A well-trained staff of engineers and job supervisors provide expert service for on-the-job applications, thus users of Unarco insulations are assured of perfection in application, as well as a better insulation service.

Industrial Insulations

PRODUCTS OF

UNION ASBESTOS & RUBBER COMPANY

Only genuine RIDGID guarantees economy

If this Housing ever Breaks or Distorts we will replace it Free
RIDGID
HEAVY DUTY
14
This Work-Saver RIDGID assures you..."No pipe wrench housing repair expense."

● You'll find no substitute for the smart-working, long-lasting qualities that have made RIDGID the world's most popular pipe wrench. Breakproof housing, full-floating hookjaw with handy pipe scale, replaceable heeljaw, adjusting nut that spins easily in all sizes, 6" to 60", comfort-grip handle—these plus the RIDGID name mean more service and tool satisfaction for your money. Buy at your Supply House.

RIDGID
★ Work-Saver Pipe Tools ★

Ridgway, Pa. . . . . The new sales promotion manager for *INTERNATIONAL HEATER CO.*, Utica, N.Y., is *WILLIAM A. MATHESON, JR.*, most recently a divisional manager for Perfex Corp.

The newly appointed public relations director of *T.A.B. ENGINEERS, INC.*, Chicago, (technical advisors, builders, and engineers), is *WINSTON I. PARKS*, who recently disposed of his interest in a Joliet, Ill., agency. Previously, he was research and public relations director of Benge Associates, personnel consultants.

The first president of the *THERMAL INSULATION SOCIETY*, Philadelphia Chapter, is *W. H. ZANE*, engineer for E. I. du Pont de Nemours & Co. The recently organized society plans to work towards insulation specifications based on a broad knowledge of engineering theory and practice. The group meets once a month at the Franklin Institute of Philadelphia.

HENRY B. SAFFORD, JR., formerly a partner in a New York advertising services concern, has been appointed advertising and sales promotion manager of the *GENERAL CONTROLS CO.*, Glendale, Calif.

F. A. HOPP, previously associated with the Delta Power Division of Rockwell Mfg. Co., has been appointed advertising manager of *CLEAVER-BROOKS CO.*, Milwaukee . . . . . The newly created post of manager of quality for *EUREKA WILLIAMS CORP.*, Bloomington, Ill., will be held by *E. RUSSELL MEYER*, formerly assistant chief inspector of the Caterpillar Tractor Co.

The recently elected president of *UNION MALLEABLE MFG. CO.*, Ashland, Ohio, and its subsidiaries, *ASHLAND MALLEABLE IRON CO.* and *UNION BRASS & COPPER CO.*, is *SOL J. JACOBSON*, vice president for the past several years, who succeeds his late brother, *JACK JACOBSON*, founder of the company.

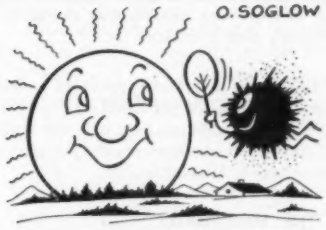
HUGH L. HAMILTON has been named to manage and direct the activities of *A. V. SMITH ENGINEERING CO.*, corrosion consultants, from the present offices at 370 Trevor Lane, Bala-Cynwyd, Pa. He had been associated with the Atlantic Refining Co. subsidiaries, Keystone Pipe Line Co. and Buffalo Pipe Line Corp.

ADELTA MFG. CO., INC., Philadelphia, has appointed *PAUL S. AGEY* as sales manager. Formerly, he was with the Busch Co., Pittsburgh, and the Brundage Co., Kalamazoo, Mich. . . . . *VERN W. PALEN*, Mt. Vernon, N. Y., will handle technical publicity for the *RESEARCH AND CONTROL INSTRUMENTS DIVISION, NORTH AMERICAN PHILIPS CO., INC.*, Mt. Vernon, N.Y.

A. D. ENGLE, member of the engineering staff of *THE AUSTIN CO.*, Cleveland, since 1920, and its district engineer at Chicago since 1945, has been appointed assistant vice president for research. *GEORGE MILLER*, the company's coordinating engineer on Atomic Energy Commission work at Oak Ridge since 1948, succeeds him in his Chicago post.

BUSH MFG. CO., Hartford, Conn., has appointed *C. L. BABIN*, long associated with the Cecil Boling Co., to the new post of assistant director of sales. An application engineering division has been created which will be headed

AIR-MAZING FACTS



DUST COOLS THE SETTING SUN! As the sun gets closer to the horizon its rays have to pass through more of the earth's dusty atmosphere. That's one reason why the sun doesn't feel as hot late in the day as it does at noon.

CLEAN BILL OF HEALTH FOR OIL! Harmful abrasive particles are removed from engine lubricants and fuels by Air-Maze liquid filters. Special "disc" construction provides many times more effective filter area than other types. Filter is all-metal. Like new after cleaning.

MUM'S THE WORD! Air rushing through engine and compressor intakes often sets up disturbing sound waves. Air-Maze filter silencers muffle the noise, help employees work better, keep the neighbors happy.

WHETHER YOU BUILD OR USE engines, compressors, air-conditioning and ventilating equipment, or *any device using air or liquids* – the chances are there is an Air-Maze filter *engineered* to serve you better. Representatives in all principal cities, or write Air-Maze Corporation, Cleveland 5, Ohio.

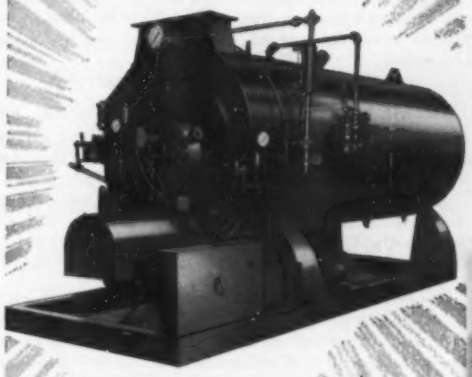
AIR-MAZE

The Filter Engineers

AIR FILTERS
SILENCERS
SPARK ARRESTERS

LIQUID FILTERS
OIL SEPARATORS
GREASE FILTERS

YEARS AHEAD in Steam Generation



CYCLONIC COMBUSTION!

The slogan "Years Ahead in Steam Generation" is *Not* just an advertising phrase but is a statement of fact.

The truly amazing method of Cyclonic combustion has been proven successful by U. S. Industry and again by the Armed Services.

Full power operation from a cold start in 15 to 20 minutes. Savings up to 50% on maintenance. Great fuel operational savings.

Details of these and many other facts regarding Cyclotherm generators are available by writing Dept. N.

Boilers are designed for oil or gas operations from 18 thru 500 h.p., 15 to 200 lbs. operating pressure.

see our CATALOG in SWEET'S FILE ARCHITECTURAL

CYCLOTHERM
STEAM GENERATORS
OSWEGO, NEW YORK

by *R. B. EBBETS*, formerly design engineer with George G. Sharp, Naval Architect, New York, and application engineer with the Cecil Boling Co.

Two new vice presidents elected by *DELAVAN MFG. CO.*, Des Moines, Ia., are *PHIL TAMASI*, in charge of production, and *HENRY F. ROTHWELL*, in charge of engineering. Mr. Tamasi has been plant superintendent for the past four years, and Mr. Rothwell has been with the company since 1945. In addition, *RAYMOND PIPER*, formerly foreman of the tool and die department, is now assistant superintendent, and *LLOYD D. LONG*, who recently joined the company, is chief of the new inspection department.

AMERICAN ENGINEERING CO., Philadelphia, has appointed *RALPH C. DAVIS*, formerly Chicago district manager, to the post of sales manager for the power plant division. His headquarters will be in Philadelphia. . . . . *J. L. MOHUN* has been appointed division manager, industrial insulation sales, *BALDWIN-HILL CO.* He will be located at the new sales office in Houston, Tex.

WILLIAM B. PIERCE has been elected a vice president of *ALLEGHENY LUDLUM STEEL CORP.*, Pittsburgh. His headquarters will be in the new research laboratory soon to be opened at Brackenridge, Pa. He will retain his former post of technical director. *ROGER S. AHLBRANDT* has been elected treasurer of the company, relieving *CLARK W. KING*, executive vice president, who also had served as treasurer. Mr. Ahlbrandt has been with the organization for 17 years, most recently as manager, stainless steel bar sales.

DR. RAYMOND C. MACHLER has been appointed director of research and a member of the executive committee of *LEEDS & NORTHRUP CO.*, Philadelphia. Formerly associate director of research, he succeeds *I. MELVILLE STEIN*, who recently was elected to the new post of executive vice president.

A. V. PETERSON has been appointed assistant sales manager for the *PAR COMPRESSOR DIVISION, LYNCH CORP.*, Toledo, Ohio. He has been with the division since 1946, most recently as southeastern district sales manager, with headquarters in Atlanta, Ga.

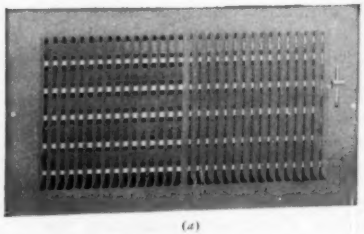
. . . IN THE TERRITORIES

For *THE FARR CO.*, Los Angeles—*W. M. NESTERUK* has been added to the Chicago district office; he will handle representative sales work for the company's central division.

For *AIR REDUCTION MAGNOLIA CO.*, a division of *AIR REDUCTION CO., INC.*, New York—*G. F. VIETOR, JR.*, most recently assistant manager of the Boston district office, has been appointed manager for the Houston, Tex., district, with headquarters at Houston, and branch offices at San Antonio, Beaumont and Corpus Christi.

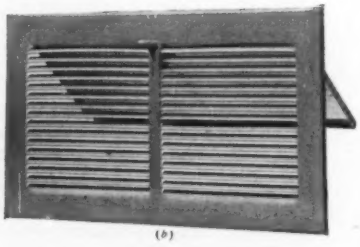
FIRST CHOICE — for All Heating & Air-Conditioning Needs

A-J REGISTERS & GRILLES



(a)

Choose the sizes, patterns, finishes and available metals you want—from A-J's complete line of quality-made registers and grilles. Their excellent design, workmanship and finish have won the approval of architects, jobbers, sheet metal shops and manufacturers. So for lower cost, quality, easier installation, use A-J products exclusively.

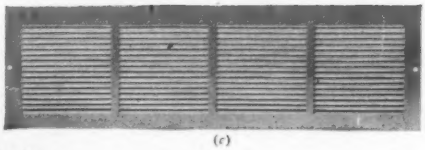


(b)

(a) **#10 WALL REGISTER, Multiple Valve.** This popular-priced, directional flow model can be used for both heating and cooling installations. Adjustable vertical fins and multiple valves allow any desired horizontal and vertical deflection. Available with matching wall grille.

(b) **#30 WALL REGISTER, Single Valve.** Specially designed for low-cost installation and efficient performance. Adjustable horizontal louvers.

(c) **#40 WALL GRILLE.** Widely used for a return air grille or for supply where no valve is required. Matches #30 Wall Register.



(c)

A COMPLETE LINE

Wall Registers • Floor Grilles • Architectural Grilles • Diffusers • Registers and Grilles for Forced Air Heating

DEALERS! JOBBERS!

Write today for helpful FREE CATALOG.

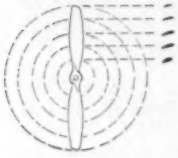
A-J

A-J MANUFACTURING CO.

2119 Washington St.
Kansas City 8, Mo.

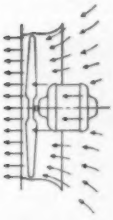
How to Buy
INDUSTRIAL PROPELLER FANS
for Efficiency and Economy

■ When you are expanding or improving your plant ventilating system, be sure to compare available fans on the following features:



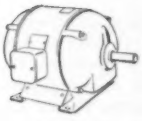
The Propeller

Look for an Airfoil section propeller of cast aluminum. It offers maximum efficiency, positive displacement, rigidity, resistance to corrosion, and freedom from bending fatigue. Protection against motor failure is provided by the unloading characteristic of Airfoil propeller sections.



The Entrance Ring

One of the most important improvements in fan design is the deeper, smoother, curved entrance ring which prevents eddy currents or back flow at propeller tips. It increases air capacity, giving more uniform velocity and greatly improved performance under pressure conditions.



The Motor

"Weatherized" motors with sealed ball bearings give trouble-free service anywhere, in any climate. Every metal part is protected from harmful rust and corrosion. Motor should be sealed and insulated for efficient, maintenance-free service even under severe moisture conditions. Motor bearings should have thrust capacity for operation in any position.

Certified Rating

The fan should be tested and rated according to the Standard Test Code of the A. S. H. & V. E. It should carry the Certified Rating Label of the Propeller Fan Mfrs. Assn. and should comply with U. S. Commercial Standards.

LET US HELP YOU—For over 20 years, Propellair has been helping leading companies solve their air moving problems. All this experience is yours, without charge. Tell us your problem and we'll give you our recommendations.

Propellair Fans have propellers, entrance rings, motors and Certified Ratings that meet the specifications outlined above. They are economical—in initial cost, in operating expense, in maintenance. Above all, they are rugged and dependable. There's a Propellair Fan for every industrial need.

Write for our new Bulletin H-3238

PROPELLAIR
DIVISION OF ROBBINS & MYERS, INC.
SPRINGFIELD · OHIO

Venting problems *meet their match*

. . . when you install TRANSITE INDUSTRIAL VENT PIPE

IF YOU HAVE a tough venting problem, the chances are good that you can solve it with Transite* Industrial Vent Pipe.

That's because this durable asbestos-cement product has proved in many installations that it can successfully resist many of the corrosive fumes, vapors, dusts and gases encountered in industrial venting operations. Its unusual chemical stability may help you realize important savings in plant maintenance . . . help you avoid frequent, costly replacements in your venting system.

Moreover, because Transite Industrial Vent Pipe is nonmetallic and therefore rustproof, it needs no painting or other protective treatment. Highly weather-resistant, it can be used for either indoor or outdoor service. A complete range of sizes up to 36" in diameter, with a complete line of rustproof, corrosion-resistant Transite fittings, adapts it to practically any job requirement. It is light in weight and can be readily cut and drilled with ordinary tools.

For further information address Johns-Manville, Box 290, New York 16, N. Y. In Canada, 199 Bay Street, Toronto, Ontario. Ask for Data Sheet Series DS-336.

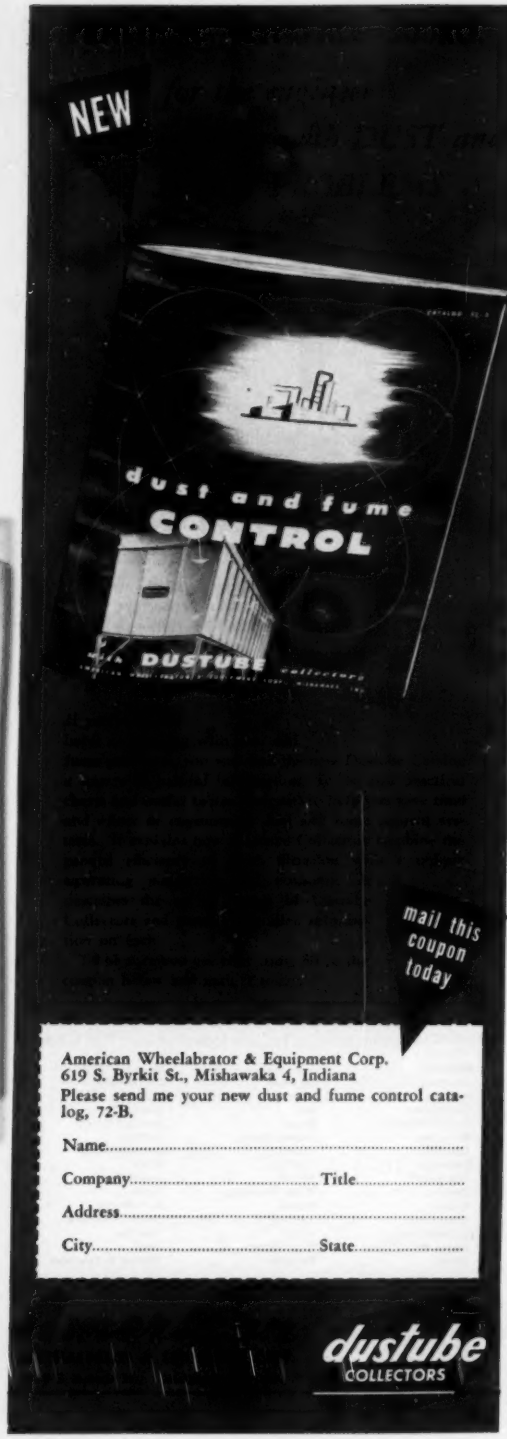
*Transite is a Johns-Manville registered trade mark

JM

Typical Industries in which Transite Industrial Vent Pipe is used:

Aircraft	Foundry	Pulp & Paper
Automobile	Furnace	Quarrying
Baking	Furniture	Railroad
Bleaching	Gas	Rayon
Boiler Works	Glass	Refrigeration
Brewing	Laboratory	Rubber
Canning	Laundry	Shipbuilding
Ceramic	Leather	Shoe
Chemical	Match	Smelting
Dairy	Meat Packing	Soap
Drug	Metal	Soft Drink
Electrical	Mining	Sugar Refining
Explosives	Paint	Textile
Farm Machinery	Petroleum	Tool
Food	Potash	Water & Sewage

Johns-Manville
TRANSITE Industrial Vent **PIPE**



For the *KAYLO DIVISION, OWENS-ILLINOIS GLASS CO.*, Toledo — *J. A. CORCORAN*, with the division since May, has been assigned to the New York branch office. For *AMERICAN STRUCTURAL PRODUCTS CO.*, a company subsidiary, *RICHARD J. CANAVAN*, formerly technical director for Producers' Council, Inc., is now district sales manager in Washington, D.C., handling the company's glass block. He succeeds *A. F. MEYERS*, who resigned recently.

For *BROWN INSTRUMENTS DIVISION, MINNEAPOLIS-HONEYWELL REGULATOR CO.*—33 new sales engineers for 23 different areas throughout the country. The group recently completed a course in industrial instrument maintenance and repair held at the division's school in Philadelphia.

For *THE RELIANCE ELECTRIC & ENGINEERING CO.*, Cleveland—new sales application engineers in four district offices. *RALPH D. ABERCROMBIE, JR.*, is assigned to Buffalo; *REX T. WILLARD*, to Atlanta, Ga.; *MERLE KIP SIEBER*, to New York; and *NICHOLAS D. McKAY*, to Detroit. In addition, *JOHN H. STEVENS* will handle a special sales analysis assignment at the Newark, N.J. office, and two new field service engineers, *CECIL D. WRIGHT* and *CHARLES F. CARNISH* have been assigned to the Charlotte, N. C., and Detroit offices, respectively.

For the *BABCOCK & WILCOX TUBE CO.*, Beaver Falls, Pa.—a new location for the Pacific Coast sales office, Los Angeles. Formerly at 714 Olympic Blvd., it is now in larger quarters in the Lawson-Chipman Building at 1111 Wilshire Blvd.

For *HAGAN CORP.*, Pittsburgh—three new sub-offices of the recently established Chicago district office. *ART SODERBERG* is in charge of the office at Rockford, Ill., covering the northern half of Illinois and Iowa and parts of Wisconsin. *WILF CHAPMAN* heads the Peoria suboffice, serving southern Illinois and Iowa. *OTTO LESSA* directs the Indianapolis office, covering portions of Indiana.

For *GENERAL CONTROLS CO.*, Glendale, Calif.—*JOSEPH FALLON*, formerly in charge of the Cincinnati office, is now factory branch office manager at the new location in Columbus, Ohio.

For *TRION, INC.*, McKees Rocks, Pa. — a new regional sales and service headquarters in the Quinby Building, 650 S. Grand Ave., Los Angeles 17. *ROBERT C. AITKENHEAD*, with the company for four years, recently has been appointed western regional sales manager, covering eleven western states.

For *ACME INDUSTRIES, INC.*, Jackson, Mich.—*ARTHUR A. REED*, for the last six years a manufacturer's representative for the Clark Bridgman Co., will handle the sale of all "Flow-Cold" products and the jobber line in Michigan.

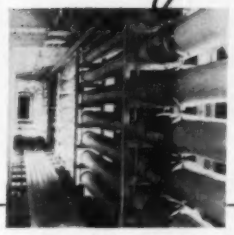
For *MAID-O'-MIST INC.*, Chicago — two new sales representatives. *PAUL THOMPSON & CO.*, Philadelphia, will cover eastern Pennsylvania, Delaware and the southern half of New Jersey. *S. R. QUINCY CO.*, Dallas, will be representative for the eastern Texas area.

Ultra-modern university campus an architectural masterpiece

DESIGNED *for tomorrow*

ENGINEERED *for tomorrow*

. . . Badger EXPANSION JOINTS . . . assure long, trouble-free life . . . an engineering masterpiece



This University with an expansive campus has erected ultra-modern buildings which are both *designed* and *engineered* for tomorrow. The structures represent the very latest trends in functional design . . . and the *steam distribution systems* must be *engineered* to perform with maximum efficiency. As you would expect, Badger Corrugated Packless Expansion Joints, constructed to the famous Directed-Flexing Self-Equalizing design, are first choice with contractors for these forward-looking universities.

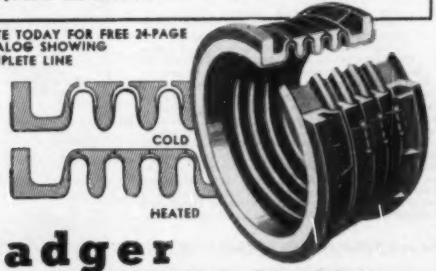
* * * * * *

What's the reason you find Badger Expansion Joints specified on *important* jobs? Because engineers have learned from years of experience to put their faith in the performance of Badger Joints . . . performance that's a result of construction features like these:

- Directed-Flexing Self-Equalizing rings . . . progressively control the movement of the all-curve corrugations.
- Packless . . . pressure-tight single tube — requires no maintenance.
- Compact . . . approximately the size of flanged fitting.
- Special forming . . . no structure-weakening stresses.
- Controlled heat treating . . . assures long life.
- Wide range of traverse — pressure — temperature.

Fabricated from deoxidized copper for normal pressures and temperatures, stainless steel or alloys to withstand high pressure, temperature and corrosion.

WRITE TODAY FOR FREE 24-PAGE CATALOG SHOWING COMPLETE LINE

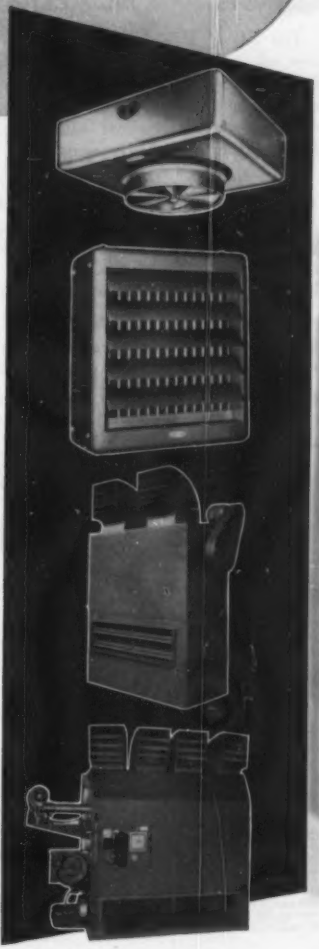


Badger
MANUFACTURING COMPANY
230 BENT STREET, CAMBRIDGE, MASS.

Heating Satisfaction Through Trouble-Free Service with

AIRTHERM

A Complete Line to Meet Every Space Heating Need



HORIZONTAL DELIVERY TYPE

VERTICAL DELIVERY TYPE

CENTRIFUGAL FAN TYPE. For heating only, or with dampers, filters, etc., for heating and ventilating.

DIRECT FIRED HEATER. A complete heating and ventilating system in one compact unit. Oil or gas fired.

SEE OUR CATALOG IN SWEET'S

For Heating Satisfaction . . . Think First of AIRTHERM Nationally Advertised

AIRTHERM MANUFACTURING COMPANY
711 South Spring Avenue
St. Louis 10, Missouri

For *FLEXITALLIC GASKET CO.*, Camden, N.J.—six new agents, including: *JNO. D. HILES CO., INC.*, Pittsburgh, for western Pennsylvania, eastern Ohio, and parts of West Virginia; *ENGINEERING PRODUCTS CO.*, Charlestown, W. Va., for West Virginia, eastern Kentucky, and part of Ohio; *CHAPMAN ENGINEERING SALES CO.*, Cincinnati, for southwestern Ohio and northern Kentucky; *DE HAVEN ENGINEERING CO.*, Indianapolis, for Indiana and western Kentucky; *STEEL & ENGINEERING PRODUCTS CO.*, El Paso, for southwestern Texas, southern New Mexico and Arizona; and *ENERGY* CONTROL CORP., Philadelphia, for eastern Pennsylvania, southern New Jersey and Delaware.

For *BUSH MFG. CO.*, West Hartford, Conn. — two new sales engineering offices. The Chicago office will be headed by *JOHN K. CAMPBELL*, formerly New England sales engineer with the Cecil Boling Co. *NORTON R. MILLER*, previously assistant sales manager for the Cecil Boling Co., will be district manager at the New York office.

For *DELCO APPLIANCE DIVISION, GENERAL MOTORS CORP.*, Rochester, N.Y.—*EDWARD E. DELMONICO* is now regional manager of the southwestern region covering Texas, Oklahoma, New Mexico, and parts of Louisiana, Arkansas, Kansas, and Colorado. He had been district representative for the Chicago area.

For *C. A. DUNHAM CO.*, Chicago—*WILLIAM ARNDT* has been named Minnesota representative, succeeding the late *ARTHUR H. KENNEDY*, with whom he had worked as a partner.

For *AIRTEMP DIVISION, CHRYSLER CORP.*, Dayton, Ohio—six new district representatives. *F. G. HILL* is assigned to Dallas; *J. I. BICKLEY*, to Washington, D.C.; *J. J. CASEY*, to St. Louis; *C. A. PALMER*, to Chicago; and *W. BRAWNER* and *D. M. THOMAS*, to Detroit.

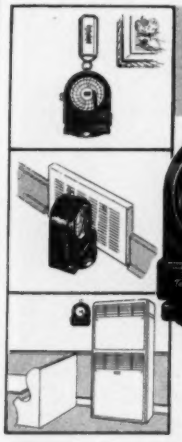
For *KRITZER RADIANT COILS, INC.*, Chicago—five new sales representatives, including: *FEDERAL SUPPLY CO.*, 120 E. Main St., Oklahoma City, Okla.; *H. L. McMURRY & CO.*, 25 Riverside Viaduct, Jacksonville 4, Fla. (branch offices in Miami and Tampa); *H. M. LUDLOW*, P.O. Box 1368, 836 Commerce Ave., Jackson, Miss.; *LEFLER WYOMONT SUPPLY CO.*, 234 Stapleton Building, Billings, Mont.; and *EDWARD R. STEPHEN*, 78 Cambridge St., Charlestown 29, Mass.

For *WAGNER ELECTRIC CORP.*, St. Louis—*M. B. ATKINSON* is the new manager of the Detroit office, succeeding *R. L. WELLS*, who has retired, and *A. W. MAAS* now heads the San Francisco electrical office, succeeding *E. D. PIKE*, who also has retired.

For *SERVEL, INC.*, Evansville, Ind.—*J. A. WALSH & CO.*, Houston, has been appointed distributor for the company's air conditioning equipment in 35 Texas counties. Offices and warehouse are at 4301 Calhoun Rd., Houston.

For *AMERICAN ENGINEERING CO.*, Philadelphia—*PAUL N. DOTZENROTH* is the new district manager in the Chicago area. He has been associated in the past with various consulting engineering organzations.

SERVICE Instruments for Measuring AIR TEMPERATURE and AIR VELOCITY



TEMPSCRIBE
Recording Thermometer

Available in 10 different ranges to cover −30°F to +100°F temperatures, and with spring-operated chart drives for any of the following chart rotations: 8 hours, 24 hours or 7 days.

This entirely self-contained, compact and reliable temperature recorder automatically writes a continuous record of temperature changes on a replaceable chart. Record shows at a glance maximum and minimum temperatures and the duration of temperatures above or below any given point; also shows the exact time of every temperature change and how rapidly it takes place. Recording pen and bi-metallic element are built in hinged, removable door which is also front of instrument. Thus, by merely changing doors it is easy to interchange temperature ranges or to convert to the Operation-Time Recorder described below. Instrument is 8" tall, 5½" wide and 4½" deep. Charts are 4½ inches in diameter.

● **OPERATION-TIME RECORDER**

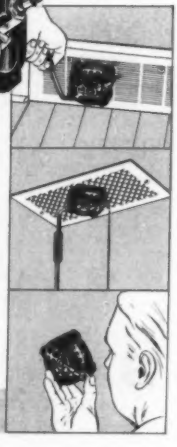
This instrument has a door unit which is identical to the door of the Recording Thermometer shown above. It makes record of number, frequency and duration of electrical operations such as starting and stopping of motors, heaters, etc. Pen is moved by the energizing of an electro-magnet when contact is closed. Available for either parallel or series connection.

Ask your Jobber or Write for Bulletin 720

FLORITE
Air Velocity Meter

Available in two styles:
One with a scale of 0-1000 ft./min., and the other with a double scale of 0-3000 ft./min. and 0-35 miles per hour.

In principle, this unique instrument operates as an anemometer but provides instantaneous, direct readings of air velocity without timing, calculations or reference to charts. Readings are obtained by holding the instrument in the air stream so that air blows against its circular face, causing rotation of a multi-blade rotor mounted in instrument housing. The circular scale surrounding the rotor instantly turns to correct air velocity reading under an index pointer on scale window. This direct-reading anemometer is particularly useful for measuring air current velocities of air conditioning systems, grille velocities and air deliveries from registers and grilles; for balancing forced air heating systems, and for checking air distribution of all kinds of ventilating systems. Furnished with detachable handle (as illustrated), and leather case.



Ask your Jobber or Write for Leaflet 760

BACHARACH Industrial Instrument Co. 7000 BENNETT STREET · PITTSBURGH 8, PA.

Set Studs into Steel or Concrete in seconds

with the

VELOCITY-POWER DRIVER

Better 3 Ways!

1. IT'S SIMPLE

One-handed operation. Load—position—fire. Stud imbedded—job done. Two basic parts—barrel and firing unit—easy to service. Integral cartridge bans matching and fitting—ready to use.

2. IT'S VERSATILE

Drives studs easily into steel or concrete. Interchangeable barrels permit driving of either ¼ or ⅜-in. studs from same firing unit. Wide range of studs available—solid head, internal or external threaded types.

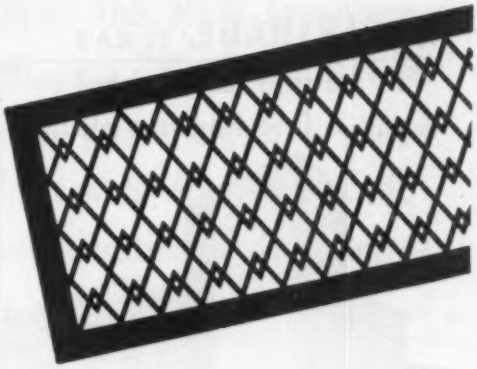
3. IT'S SAFE

Center-fire cartridges plus spring-loaded safety arm that must be rotated 180 degress and held before stud can be fired makes accidental discharge impossible. Barrel design and long bearing area of piston avoids ricochet, flash, recoil. Cartridge assemblies assure right load for the job. Write for Bulletin No. TA-17.

DEALERS WANTED—Big, profitable sales opportunity in a broad market with this time, labor and money saving tool for maintenance, repair and construction work. Cartridge-studs bring repeat business. Act now!

VELOCITY POWER TOOL COMPANY

7505 Thomas Boulevard
Pittsburgh 8, Pa.



To harmonize with any decorative motif

there's a choice of over one hundred Hendrick Ornamental Grilles

Ornamental grilles, usually being the largest and most conspicuous article of hardware in a room, are a prominent factor in any decorative scheme, and from the wide range of Hendrick designs it is easy to select a grille to meet any requirement.

Hendrick Grilles can be supplied in a wide range of overall dimensions, bar sizes, number of perforations and size of perforations. Ample open areas assure a good air flow, the design illustrated, M No. 9, having 67% open area.

Made in accurate sizes from heavy gauge metals, Hendrick Grilles have no burrs or other imperfections, and always lie flat and are easy to install because of a special flattening operation in their manufacture. Write for detailed information.

1876—Seventy-Fifth Anniversary—1951

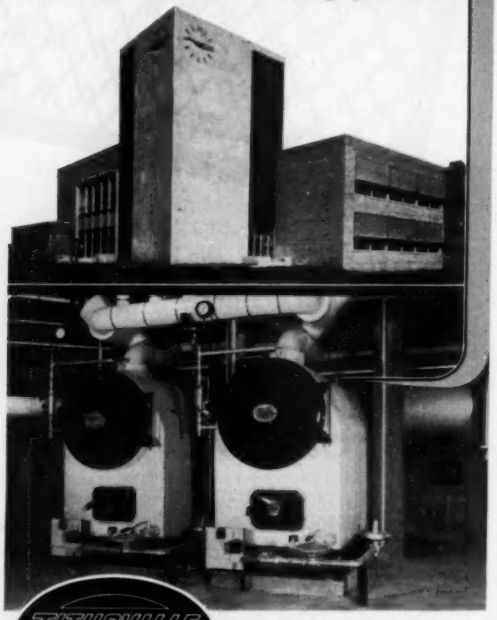
See this catalog in SWEET'S

Perforated Metals
Perforated Metal Screens
Wedge-Slot Screens
Architectural Grilles
Mitco Open Steel Flooring
Shur-Site Treads, Armorgrids

HENDRICK
Manufacturing Company
48 DUNDAFF STREET, CARBONDALE, PA.
Sales Offices in Principal Cities

AT CARTHAGE, TEXAS

. . . a fine new school
. . . a fine heating plant!



TITUSVILLE
IRON WORKS CO
TITUSVILLE, PA

Compact
STEEL
HEATING BOILERS

The heating requirements of the new Carthage Junior and Senior High School are served effectively by these two Titusville Compact Steel Boilers. Rated (normal) at 17,000 square feet of steam radiation per hour—the modern gas-fired units occupy minimum boiler room space. Titusville manufactures a complete line of high and low pressure fire and watertube boilers to meet all capacity and pressure requirements. Our bulletin, "Meet the Titusville Family" sent on request.

THE TITUSVILLE IRON WORKS CO.

A division of Struthers Wells TITUSVILLE PENNA.

Representatives in Principal Cities

NEW BOOKS & REPORTS

Study of U.S. Manufacturing Industries' Fuel Consumption

Comparative Costs of Competitive Fuels, by Leland W. McCloud, Assistant Professor, Department of Economics, West Virginia University, makes available information on the consumption of eight major competitive fuels (those competing for markets in industries which can use two or more fuels). The comparative costs per heat unit (Btu) of bituminous coal, anthracite coal, coke, fuel oil, natural gas, manufactured gas, mixed gas and electric energy are given for various geographically grouped industries. Data includes total consumption of each fuel in terms of physical units and heat units; percentage of the total fuel cost represented by each fuel; and the proportion of the total energy (on a Btu basis) supplied by each fuel.

Copies of the 89 page study, Vol. 1, No. 4, in West Virginia University's business and economic studies series, may be obtained from the Bureau of Business Research of the University, Morgantown, W. Va.

Standards and Specifications for Mineral Wool Insulation

The Industrial Mineral Wool Institute has published an insulation handbook, *Mineral Wool Insulation Specifications & Standards*, for use as a guide to proper selection of materials and proper application practices. It includes 21 specifications and standards by four government agencies and the American Society For Testing Materials. Covered are standard dimensions, temperature limits, thicknesses, auxiliary materials, testing methods, and other subjects relating to industrial utilization of the insulation (including its use in piping and related fields). The handbook may be kept up-to-date by the insertion of additional pamphlets, notes, and newly-issued specifications.

Copies may be obtained from the Institute, 441 Lexington Ave., New York 17, at $3.20 each.

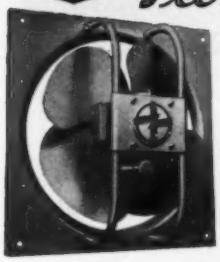
Report Considers Natural Ventilation of Buildings

The problem of how best to move air has always been an important one in the Southwest. *Some General Considerations in the Natural Ventilation of Buildings*, research report no. 22 of the Texas Engineering Experiment Station, The Texas A and M College System, College Station, Tex., discusses the characteristics of air flow, the application of these characteristics to specific situations, planning considerations for natural ventilation and the model testing method as it can be used for predicting air flow in a building.

It is recommended that architects and engineers locate the building in the free sweep of the wind, design the building with consideration to location of pressure areas and wind shadows, provide inlet openings in the high pressure walls and outlet openings in the low pressure

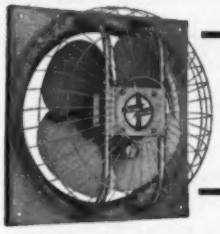
FOR EXHAUST VENTILATION OF COMMERCIAL SPACES

Peerless Electric



EXHAUST FANS

With dependable Peerless Electric construction throughout, Peerless Electric Exhaust Fans do an excellent job of ventilating tailoring and cleaning plants, taverns, kitchens, restaurants, retail stores, and similar establishments. These fans are completely designed and manufactured by The Peerless Electric Company, manufacturer of motors, fans and blowers since 1893.



Fan with Inlet Guard

MOTORS

Long hour duty permanent split capacitor type.

CONSTRUCTION

The sturdy steel panel mounting simplifies installation and neatly covers the wall opening. Entire fan is finished in attractive Hammerloid baked enamel. Furnished with or without inlet guards and with or without controllers.

RATINGS

Rated in accordance with Standard Test Codes.

Write for complete specifications and prices

THE PEERLESS ELECTRIC COMPANY

Established 1893 • *WARREN, OHIO*

Peerless Electric

MOTORS • FANS • BLOWERS

With This NEW Improvement Niagara "No-Frost Method" puts you a big step ahead in trouble-free, automatic refrigeration or freezing

Niagara "No-Frost Method" keeps frost and ice COMPLETELY OUT of your cooling, chilling, freezing or cold storage.

It uses Niagara No-Frost Liquid Spray to keep frost and ice from ever forming. It gives you, automatically, refrigeration with no defrosting, and full capacity NEVER cut down by ice building up progressively on refrigeration coils.

Now, a NEW design No-Frost Liquid concentrator, using a new principle, takes away moisture as fast as it is condensed by evaporating it at low temperature —not boiling it away at high temperature. It has 14 times the capacity of the old method per dollar of investment — one concentrator will handle a battery of high capacity spray coolers.

This gives you more refrigeration at lower cost; less machinery in less space. You operate at high suction pressure, saving power and wear and tear on compressors.

The extra capacity and lower cost both for equipment and operating makes this method advantageous for every type of refrigeration use—both for freezing and for moderate temperatures—for large "live" loads as in meat chilling or in fruit and vegetable precooling — for rooms that are filled and emptied of product daily, such as milk rooms and terminal storage warehouses.

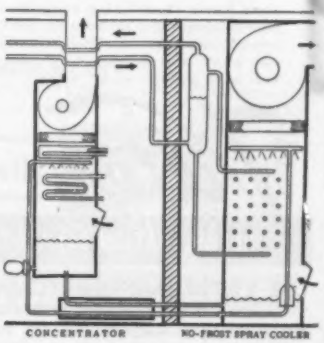
You get true trouble-free refrigeration . . . No brine . . . no salt solution . . . no dirt . . . no mess . . . It is entirely clean; you get rid of dirt and odors. You reduce both equipment and operating costs.

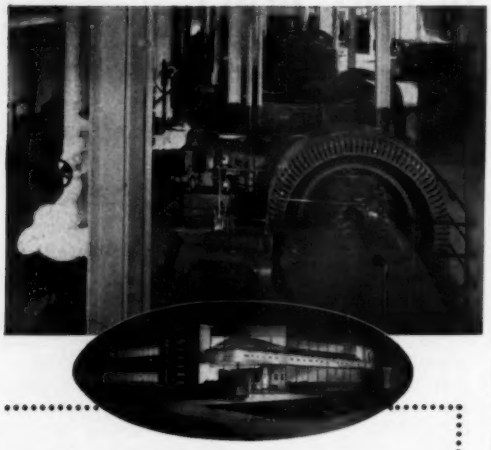
For complete information write to the Niagara Blower Company, Dept. HP 405 Lexington Avenue, New York 17, New York.

If you need extra capacity . . . the Niagara "No-Frost Method" can help you get it with your present compressor.

•

A simple method, easily maintained. Saves a third of your refrigeration cost . . . Ask for Niagara Bulletins 118 and 119.





It's VILTER Again—

AS THE MILLER BREWERY GROWS ON

Back in 1903, The Miller Brewing Company bought its first Vilter compressor—a 170-ton horizontal. Since that time, Miller has made plant and refrigeration additions almost constantly to meet their phenomenal growth. 100% of Miller's compressor equipment has been furnished by Vilter, and a total of over 2300 tons of Vilter compressor capacity will shortly have been installed.

The Vilter equipment now in operation at Miller includes two electric-driven duplex horizontals, two steam-driven horizontals, two electric-driven duplex verticals, air units, Glycol coolers, compressors for liquefying CO_2, condensers, accumulators, liquid receivers, and thousands of feet of pipe coils. A 566-ton duplex compressor is now being fabricated for Miller.

Over half of the breweries in the United States know what Vilter dependability means. Time after time, like Miller, they have re-ordered Vilter, because they know that Vilter equipment means less upkeep, less down-time, far more overall satisfaction. Your nearby Vilter man can show you quickly how you, too, can save money with Vilter.

Vilter

REFRIGERATION and AIR CONDITIONING

THE VILTER MANUFACTURING COMPANY
MILWAUKEE 7, WISCONSIN

Ammonia and Freon Compressors • Pakicers • Evaporative and Shell & Tube Condensers • Pipe Coils • Valves and Fittings • Can Ice Plants

walls, design interior partitions and landscaping to facilitate air flow, and control the direction of air flow by proper location, design and sizing of openings.

Copies of this illustrated, 43 page report may be obtained from the experiment station.

Construction Handbook Includes Data on Piping, Heating, and Ventilating

A Reference Handbook for Construction Engineers, Architects, Builders, Superintendents of Construction, and Building Construction Foremen, by H. G. Richey, includes chapters on plumbing, piping, and sewage disposal (pipe and fittings, gas piping, sewage ejectors, etc.); and on heating and ventilating (warm air, steam, vacuum and radiant heating, air washers, etc.).

The 1639 page book is published by the author, a district engineer (retired) for construction of public buildings, U.S. Treasury Department. It is available from him, at 1328 N. Rendon St., New Orleans, La., for $10.00 a copy.

OTHER BOOKS AND REPORTS RECEIVED

THE FEASIBILITY OF USING MODELS FOR PREDETERMINING NATURAL VENTILATION, by Elmer G. Smith, research physicist, is research report No. 26 of the Texas Engineering Experiment Station, The Texas A and M College System, College Station, Tex. It describes a series of experiments which showed that convenient size models and convenient air speeds could be used to predetermine the natural ventilation characteristics of proposed buildings. In addition to investigating various model sizes and air speeds, the author sought information on methods which could be used to determine air flow patterns and to measure air speeds in and around models. Diagrams and charts illustrate equipment and comparative air flow data.

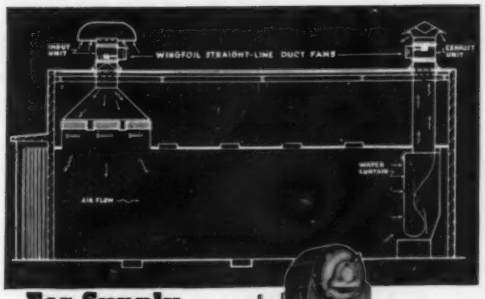
Copies of the 25 page report may be obtained from the Experiment Station.

FUEL OIL MANUAL, by Paul F. Schmidt, chief chemist, Allied Oil Co., Inc., Cleveland, gives data on the properties of fuel oil, the possibilities and limitations of each grade of oil, methods for assuring uniform quality and efficient combustion, and for minimizing costs.

This 160 page book is available from the publisher, The Industrial Press, 148 Lafayette St., New York 13, at $3.50 a copy.

HEAT EXCHANGE INSTITUTE STANDARDS FOR BAROMETRIC AND LOW LEVEL JET CONDENSERS—The third edition of the standards now has been issued by the institute. It includes nomenclature, definitions and standards for condenser performance, and information needed in the calculation of water requirements. Also covered are data on vacuum pump capacity, installation, atmospheric relief valves, etc. A series of conversion tables, useful in the calculation and installation of this type of jet condenser, also is given.

The standards may be obtained from the institute at 122 E. 42nd St., New York 17, for $1.00 a copy.



For Supplying Fresh Air or Exhausting Air containing Paint Spray, Dirt, Steam, Explosive Vapors, etc. in Any Volume or Pressure

The Wingfoil Straight-Line Duct Fan is Unexcelled

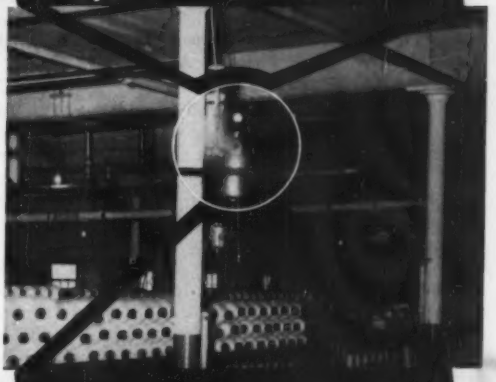
It may be used as shown above as a roof intake or exhaust, or it may be inserted in a run of duct, occupying no extra space. The motor is located outside the casing, driving the fan by means of an enclosed V-belt. It is light, compact and easily handled, and may be mounted either horizontally or vertically. *Write for Bulletin F-10.*

L. J. Wing Mfg. Co. 140 Vreeland Mills Rd. Linden, New Jersey

Factories: Linden, N. J., Montreal, Canada

Wing STRAIGHT-LINE DUCT FANS

Question: What about Unit Type Steam Humidifiers?



Answer: Armstrong Unit Type Steam Humidifiers are ideal for overcoming wintertime dry air conditions for the following reasons:

- **Fully Automatic.**
- **Accurate Control**—within 1%—2% relative humidity
- **Clean**—no residue in the air
- **Quiet**—acoustically designed
- **No cooling effect**—raise room temperature a degree or two
- **Economical to operate**—pennies per day per unit—½ to ¼ the price of water spray equipment
- **Low in first cost** approximately $182 complete for a unit to handle up to 40,000 cu. ft.
- **Easy to install anywhere**—hooked up to existing steam and electrical systems much like unit heaters
- **Dependable**—quality materials and workmanship
- **Guaranteed**—complete satisfaction or your money back. Write today.

ARMSTRONG MACHINE WORKS
874 Maple Street, Three Rivers, Mich.

For Full Details Send for BULLETIN 1773

Operating principles, capacities, sizes, prices, hookups, selection data and other useful information—all included in Bulletin 1773. Send for your copy today.

ARMSTRONG *Steam* HUMIDIFIERS

BUILT BY THE MAKERS OF ARMSTRONG STEAM TRAPS

MEETINGS & CONVENTIONS

39th NATIONAL SAFETY CONGRESS AND EXPOSITION—to be held in Chicago, October 8 to 12. Sessions on industrial safety are scheduled for the Stevens, Palmer House, Congress and Morrison hotels. For further information write R. L. Forney, general secretary, National Safety Council, 425 N. Michigan Ave., Chicago 11.

14th JOINT FUELS CONFERENCE—Sponsored by the Coal Division, American Institute of Mining and Metallurgical Engineers, 29 W. 39th St., New York 18, and the Fuels Division, American Society of Mechanical Engineers (same address), the conference will be held October 11 and 12, at the Roanoke Hotel, Roanoke, Va.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS, 500 5th Ave., New York 16—A technical conference on the application of fractional horsepower motors to refrigeration equipment and pumps has been scheduled by the institute for October 11 and 12, at the Dayton Biltmore Hotel, Dayton, Ohio. For information regarding registration, etc., write D. C. Breeding, Frigidaire Div., General Motors Corp., Dayton, Ohio.

AMERICAN GAS ASSOCIATION, 420 Lexington Ave., New York City—The 33rd annual convention, St. Louis, October 15 to17. The Jefferson hotel will be headquarters for the residential gas and industrial and commercial gas sections; the Mayfair and Lennox hotels for the operating section; and the Statler Hotel will house the accounting section. Requests for reservations should be sent to the Hotels Convention Bureau, AGA, Room 405, 911 Locust St., St. Louis 1.

NATIONAL ASSOCIATION OF CORROSION ENGINEERS, 919 Milam Bldg., Houston 2, Tex.—The annual meeting of the association's South Central Region is scheduled for October 18 to 20, at Corpus Christi, Tex.

HEATING FORUM—Sponsored by heating equipment wholesalers from Bloomington, Galesburg and the Peoria area, the forum, to be held October 22, in the Jefferson Hotel, Peoria, Ill., will be attended by heating contractors and engineers. Addressing the group will be Ralph Patterson, Bell & Gossett Co., William Pennington, Dole Valve Co., and Richard Flickinger, McDonnell & Miller, Inc.

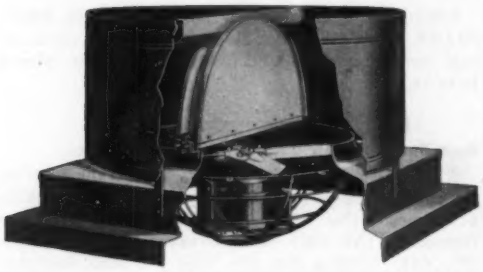
PLUMBING AND HEATING INDUSTRIES BUREAU, 35 E. Wacker Drive, Chicago 1—The annual meeting will be held at the Palmer House, Chicago, October 25.

THE 7th ALL-INDUSTRY REFRIGERATION AND AIR CONDITIONING EXPOSITION—to be held at Navy Pier, Chicago, November 5 to 8. The affair is sponsored by the Refrigeration Equipment Manufacturers Association, 1346 Connecticut Ave., N.W., Washington 6, D. C.

CANADA'S 1951 *POWER SHOW*—Sponsored by the Institute of Power Engineers, 496 Church St., Toronto,

PENN VENTILATORS
WORK LIKE A BREEZE
Liberty® VENTILATOR
LIBERTY VENTILATOR . . . a reliable standard for modern ventilation. All the air currents—upward, downward, horizontal or swirling—are converted into powerful suction forces by ingenious arrangement of baffles & wind vanes. Capacity Ratings, based on all-angle wind tests*, prove the Liberty free from backdrafts!
*United States Testing Co., Inc. Test #E-1532-9-11-50
DYNAFAN . . . engineered for quiet air removal where static pressure and other special conditions are encountered.
• Motors out of air stream!
• Operating parts easily accessible!
• Statically and dynamically balanced non-overloading fan!
• Units are low—blends well with modern architectural design!
Write for complete literature today! . . . Representatives and Distributors in Principal Cities.
Penn DYNAFAN®
FOR MORE THAN 25 YEARS THE BUILDERS' ROOF TOP LINE
PENN VENTILATOR CO.
PHILADELPHIA 40, PA.

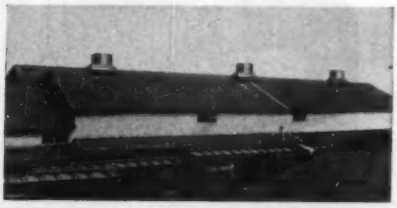
The Whirlout...
another new Roof Ventilator by Swartwout to help you solve industrial Ventilation Problems efficiently, economically



You can literally *throw* the heat and fumes out of factory workrooms with this newest "straight-through" roof ventilator. Whirlout is a simple, sturdy unit of the type that has been growing in popularity for several years.

For many situations where fast powerful exhaust is desired above furnaces, ovens, pickling vats, or *any* operation that creates heat, smoke or fumes, Whirlout does it in a hurry. The circular body forms a chute directing the airflow straight up, to be dispersed by air currents. There's practically no air friction created except by the center dampers, which are necessary to make the ventilator weather proof when not operating. (Weather is kept out by the blast of air when fan is operating.)

Whirlout is powered by an efficient ball bearing motor driving an airplane type propeller with square-tipped blades. The air-stream is guided by a streamlined throat directly above the fan. Ten sizes, with a wide selection of cfm capacities, are available. It's worthwhile investigating Whirlout for your tough ventilating jobs. Write for full description—Bulletin 346.

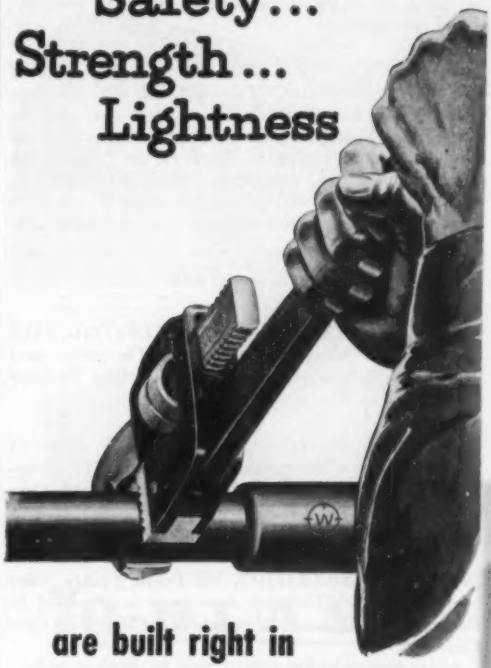


The Swartwout Co.

18511 Euclid Avenue • Cleveland 12, Ohio

Industrial Ventilation Specialists Since 1904

Safety... Strength... Lightness



are built right in the *Improved* Walco

Walco, the strongest pipe wrench on the market today, is also the safest—and lightest all-steel wrench available. Why? Because welding—with all its inherent strength, safety and weight-reduction advantages—has been used to join the Improved Walco's housing and handle into one integral unit . . . a unit that makes the Walco so rugged that all tests show it far exceeds the requirements set up by Federal Specification GGG-651a for Type II Heavy Duty Adjustable Pipe Wrenches.

The jaws of the Improved Walco are carefully machined and will not slip, even severe abuse will not spoil the wrench's grip or quick biting action. A flexible, double-acting, quickly replaceable spring—an Improved Walco feature for which patent is pending—gives the wrench fast, positive ratcheting action. Adjustment is easy—the nut may be spun with the palm of the hand. The proper wrench opening can be determined by a calibrated pipe scale on the movable jaw.

Ask your Walworth Distributor to show you the Improved Walco—the strongest-made and longest-lived pipe wrench on the market today. Buy it—you will save money in the long run.

WALWORTH

valves • fittings • pipe wrenches

60 EAST 42nd ST., NEW YORK 17, N. Y.

DISTRIBUTORS IN PRINCIPAL CENTERS THROUGHOUT THE WORLD

the show will be held in the Royal York Hotel, Toronto, November 26 to 29, in conjunction with the institute's annual convention.

CONFERENCE ON LABORATORY DESIGN FOR HANDLING RADIOACTIVE MATERIALS—Co-sponsored by the American Institute of Architects and the U.S. Atomic Energy Commission, and conducted by the Building Research Advisory Board of the National Research Council, 2101 Constitution Ave., Washington 25, D.C., the symposium will be held November 27 and 28 in Washington. Among the subjects to be presented are:

The Design of Laboratory Facilities for Research with Radioactive Materials at Various Levels, by Alexander Mackintosh.

Air Supply and Exhaust for Laboratories Handling Radioactive Materials, by Carleton P. Roberts.

AMERICAN SOCIETY OF REFRIGERATING ENGINEERS, 40 W. 40th St., New York 18—The annual meeting will be held at the Roosevelt Hotel, New Oreleans, December 2 to 5.

NATIONAL HEATING WHOLESALERS ASSOCIATION, 609 Union Commerce Bldg., Cleveland 14, Ohio—The annual meeting will be held at the Statler Hotel, Cleveland, December 3 and 4.

NATIONAL WARM AIR HEATING AND AIR CONDITIONING ASSOCIATION, 145 Public Square, Cleveland 14—The 1951 annual convention is scheduled for December 5 and 6, and will be held at the Hotel Cleveland, Cleveland.

THIRD PLANT MAINTENANCE SHOW—To be held at Convention Hall, Philadelphia, January 14 to 17. Registration and hotel information may be obtained from Clapp & Poliak, Inc., 341 Madison Ave., New York, the exposition management. An exhibitors' list is available from Banner & Greif, 250 W. 57th St., New York 19.

AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS, 51 Madison Ave., New York—The 58th annual meeting will be held in St. Louis, January 28 to 30. The next International Heating, Ventilating and Air Conditioning Exposition will be held in conjunction with the society's 59th annual meeting, to be held in Chicago, January, 1953.

NATIONAL ASSOCIATION OF CORROSION ENGINEERS, 919 Milam Bldg., Houston, Tex.—The 1952 annual conference will be held at Galveston, Tex., March 10 to 14.

Data Books for Air Conditioning, Piping, etc.

A new and revised series of *Dollar Data Books* covering air conditioning (No. 638), mechanical drawing (No. 617), metals (No. 621), piping data (No. 653), steam engineering (No. 620), thermodynamic tables and charts (No. 634), welding data (No. 645) and other fields has been published by Lefax and Co., 9th and Sanson Sts., Philadelphia 7.

Containing approximately 140 loose leaf pages, each book may be obtained from the publisher for $1.00.

Available from jobbers stock

weil TVC CONDENSATE PUMPS

ENGINEERED FOR LOW PRESSURE SYSTEMS
EASY TO LAY OUT – PERMITS OVERHEAD LINES

- low return connections
- low water line
- low speed — longer life
- cast iron receiver

CAPACITIES 500 TO 10,000 SQ. FT. E.D.R.
WRITE FOR BULLETIN TVC-300

NRG UNDERGROUND CONDENSATE PUMPS

Takes the low returns and pumps them back to the boiler — requires limited space. Write for Bulletin NRG 200-B.

FIG. TVC-302

weil PUMP COMPANY 1522 N. FREMONT ST., CHICAGO 22, ILL.

Speed up Shearing and Hammering!

Switch to BLACK & DECKER POWER

BLACK & DECKER ELECTRIC PORTO-SHEARS* cut sheet metal too tough for snips. Speed up jobs where snips are slow. Save you time and cut your costs on hundreds of jobs. Fast, powerful shearing action eliminates hard muscular strain. Easy to follow straight lines, irregular patterns, curves to small radius because *cutting action is always visible!* Two models: 12-gage and 16-gage capacities.

BLACK & DECKER ELECTRIC HAMMERS speed up such jobs as drilling holes for toggle bolts in concrete and brick—cutting mortar out of joints to install flashings—cutting through walls, shaping timbers, channeling floors. High-speed, amazingly husky, deliver thousands of sharp, positive hammer blows per minute. Drive star drills, speed bits, chisels, many other tools. Light, compact, completely self-contained, require no transformer or extra equipment. Four models: rated by drilling capacity in concrete for ½", ¾", 1⅛", 2".

SEE YOUR NEARBY B&D DISTRIBUTOR for demonstrations, full details, expert help in selecting the right tools for your jobs. Write for free catalog to: THE BLACK & DECKER MFG. Co., 628 Pennsylvania Ave., Towson 4, Maryland.

*Trade Mark Reg. U. S. Pat. Off.

DRILLS • SANDERS • SCREW DRIVERS • BENCH GRINDERS

LEADING DISTRIBUTORS EVERYWHERE SELL

B&D Black & Decker PORTABLE ELECTRIC TOOLS

Hospital in Montgomery, Alabama, equipped with No. 5 Lo-BLAST Burner

FOR EVERY TYPE OF BUILDING

LO-BLAST

IS THE GAS HEATING "BUY"

From coast to coast, you'll find Lo-BLAST Power-type Conversion Gas Burners heating buildings ranging from small residences to entire villages heated from a central plant. Preference for Lo-BLAST springs from proved efficiency, safety, durability . . . *operating records show an average saving of* 10%

Compare these operating and construction features:

Power Burner Design. Perfect combustion, regardless of draft—a proved fuel saver. Safe and efficient for down-draft units.

Simple to Install. Every Lo-BLAST is factory tested on gas and shipped assembled.

Safe Operation. Lo-BLAST comes equipped with dependable, foolproof safetys.

Soft, Quiet Flame. No "pop" when the Lo-BLAST goes on or off—burns so smoothly you can hardly tell it's running.

Easy to Service. All parts are accessible—nothing in the firebox but the fire. Simplicity of design and durable construction reduce service to a minimum.

Long Lasting. Many Lo-BLAST Burners have been in operation 15 years without service.

Complete Capacity Range. Units available from 70,000 to 20,000,000 BTU input.

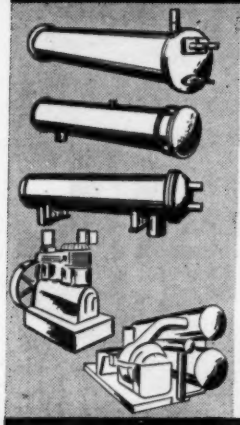
Lo-BLAST Economite

The "mighty-mite" of conversion gas burners—capacities from 70,000 to 300,000 BTU. All the famous design features of the larger Lo-BLAST packed into a low-cost unit for residential use. Write for descriptive literature.

This battery of Lo-BLAST Burners handles 11,000 sq. ft. of steam radiation plus 10,000 gallons of hot water per day.

MID-CONTINENT METAL PRODUCTS CO.
1960 N. Clybourn Ave., Chicago 14, Ill.

QUICK - PROMPT
RETUBING SERVICE



on
FREON - AMMONIA - CO_2
CONDENSERS AND
COOLERS
—ANY CAPACITY.
STEAM CONDENSERS

BOILERS
HEAT EXCHANGERS OR
ANYTHING WITH TUBES

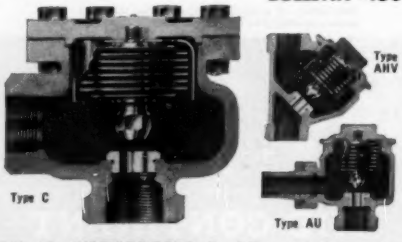
Reconditioning and
Overhauling Centrifugal
and Reciprocating Pumps
Centrifugal and
Reciprocating
Refrigerating Compressors
Large Stock Tubes
on Hand

THE MAINTENANCE DEPARTMENT
of CONDENSER SERVICE & ENGINEERING CO.
Phones: New York, BE ekman 3-9363; Hoboken, HOboken 3-4828
100 River Street Hoboken, N. J.
For New Equipment - Write our general office
95 River St., Hoboken, N. J.

In This Plant Nicholson Traps

SAVED 10% IN STEAM COSTS

Chief Engineer H.F.D. stated, after Nicholsons replaced mechanical traps in his plant: "Saving in steam waste cut our fuel cost at least 10%. Yet application temperatures were up 30°-40°. And relief of all air-binding effected faster warm-up". 5 types for process, heat, power. Sizes, ¼" to 2"; press. to 225 lbs. To see why leading plants are increasingly standardizing on Nicholson traps send for .....
BULLETIN 450



W. H. NICHOLSON & CO. 198 Oregon St. Wilkes-Barre, Pa.
Sales and Engineering Offices in 53 Principal Cities

RECENT TRADE LITERATURE

For your convenience in obtaining copies of these bulletins, see coupon on page 189. If you write direct to the manufacturer, describe carefully what literature you want, as the number given first in each item is for use only when sending requests to Heating, Piping & Air Conditioning.

Air Conditioning and Refrigeration

HPAC 101—Frick Co., Waynesboro, Pa.—Bulletin 29a/FR describes "Freon" refrigeration ("Eclipse" compressors); unit air conditioners; air conditioning systems; ammonia refrigeration (enclosed compressors, etc.); coolers for air, water, brine, etc.; condensers; and control equipment (valves, fittings, etc.).

Air Distribution in Television Studies

HPAC 102—Barber-Colman Co., 1226 Rock St., Rockford, Ill.—Bulletin F-4712 describes and illustrates installations of air distribution equipment in television studios, where high heat loads and low noise level requirements must be taken into account. Various models of outlets, grilles and registers are shown.

Air Filters and Precipitators

HPAC 103—American Air Filter Co., Inc., 215 Central Ave., Louisville 8, Ky.—Folder illustrates installation of various types of air filters and precipitators at a pharmaceutical manufacturing plant.

Air Filters for Warm Air Heating Equipment

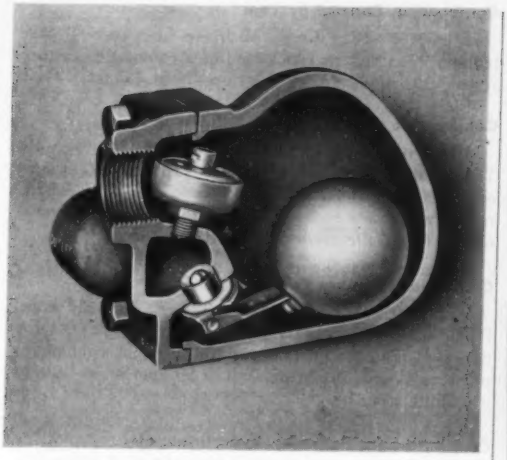
HPAC 104—Owens-Corning Fiberglas Corp., 1911 Nicholas Bldg., Toledo 1—50 page catalog contains an alphabetical listing of 166 manufacturers of filter-equipped warm air furnaces and blower units. Under each company are the sizes and the number of filters needed for the units it manufactures, and the manufacturer's identification numbers. The features of "Dust-Stop" filters are outlined.

Aluminum Pipe and Fittings

HPAC 105—Aluminum Co. of America, 801 Gulf Bldg., Pittsburgh 19 — 12 page booklet treats applications, special features and installation procedures for "Alcoa" aluminum pipe and fittings. Tables give dimensions, weights, dimension tolerances, collapsing and bursting pressures, and other pipe data.

Blow-off Valves

HPAC 106—Yarnall-Waring Co., 107 Mermaid Lane, Philadelphia 18—Bulletin B-425 (1951) giving information on blow-off valves for pressures up to 400 lb, replaces the corresponding bulletin printed two years ago. It covers seatless valves (two types) and double tightening valves, and gives general information on flange dimensions and typical applications.



This Trap Responds *Instantly* to Load Change

Heavily constructed to give the true economy of long life, B&J Traps can handle sudden and large condensate loads efficiently, regardless of temperature. The thermostatic element vents air rapidly.

Made in five sizes for loads up to 5750 lbs. of water per hour. Working parts readily accessible for easy maintenance — the thermostatic element, valve piece and seat are locked in adjustment in a cage unit, only one piece to replace, no special tools needed.

Write for full details — *do it today.*

B&J

BARNES & JONES, Inc.

128 BROOKSIDE AVENUE, BOSTON 30, MASS.

Representatives in all principal cities

PREFERRED FOR BETTER PERFORMANCE

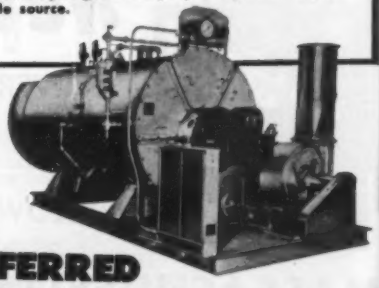
LOWEST INSTALLATION COST

That's right! To install a Preferred Horizontal Rotary Oil Burner costs less than any other industrial oil burner. Exclusive and patented features cut time and labor needed for wiring, brickwork and piping. For example, all basic burner components are completely wired to the terminal junction box. Preferred has been able to lower installation costs because of their years of experience as a dealer, installer and distributor of oil burners. And they have put this practical experience to work for you.

Originally designed to meet the exacting requirements of the Preferred Unit Steam Generator, its fully automatic operation with residual fuels proved so successful that it has won wide acceptance for conversion applications.

It is available with associated Preferred products such as enclosed, pre-wired, union approved panels as well as pump and heater sets where applicable.

At Preferred you get all major job requirements from a single source.



PREFERRED Unit Steam Generator

The Preferred Unit Steam Generator is a custom-built boiler designed to maintain its guaranteed efficiency for a quarter of a century with a minimum of maintenance. It is the result of 28 years of combustion experience combined with the latest technical advances in pressure vessel design. That is why the Preferred unit offers the lowest installation cost, greatest economy and longest life of any steam generator.

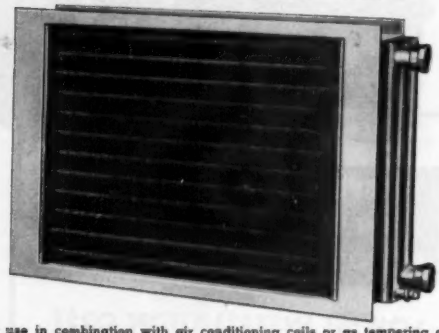
Write for Burner Bulletin 175, Generator Bulletin 1000 and material cost estimates on your application.

PU-201

PREFERRED UTILITIES MANUFACTURING CORPORATION

1860 BROADWAY, NEW YORK 23, N. Y.

New REMPE HI-CAP STEAM HEATING COILS with DEFROSTER



For use in combination with air conditioning coils or as tempering and booster units in long heating ducts.

Available in Single Row Type with BTU per hour capacity from 60,000 to 360,000. In Double Row Type, for heavy duty service, in capacities from 129,000 to 775,000 BTU per hour.

Heavy gauge steel casings. Copper Tubes and Headers. Tested 350 lbs. air pressure for steam working pressures up to 125 lbs. Defroster — standard equipment. Also suitable for hot water.

Write for details.

REMPE CO. — HEAT TRANSFER EQUIPMENT — Founded 1890

REMPE COMPANY

342 N. Sacramento Blvd., Chicago 12, Ill.

THE *NEW* UNIVERSAL TYPE "N" BLOWER

MASSACHUSETTS . .

By changing the position of the oil cup, the four popular discharges (lower horizontal, upper horizontal, down-blast and up-blast) can be obtained. Sizes 7 to 16½ inches wheel diameter.

WRITE FOR BULLETIN No. 110 CATALOG

MASSACHUSETTS BLOWER DIVISION

The **BISHOP & BABCOCK** *Mfg. Co.*

4701 HAMILTON AVENUE — CLEVELAND 14, OHIO

Combustion Control System

HPAC 107—Hays Corp., Michigan City, Ind.—8 page bulletin illustrates an installation of a combustion control system at the Falstaff Brewing Corp. in St. Louis.

Condensate Meters

HPAC 108—American District Steam Co., Inc., North Tonawanda, N.Y.—Bulletin R-513 explains the design, construction, installation and operation of the "Adsco" rotary condensate meter for determining steam consumption where all the condensate can be captured.

Controlled Volume Pumps

HPAC 109—Milton Roy Co., 1300 E. Mermaid Lane, Philadelphia 18—Bulletin 151 (24 pages) contains selection and application data on controlled volume pumps for pumping liquids in amounts up to 50 gpm or as little as 3 milliliters per hr.

Convectors for Schools, Institutions, etc.

HPAC 110—Airtherm Mfg. Co., 711 S. Spring Ave., St. Louis—Catalog 702A features "Airtherm" convectors for schools, institutions, public buildings, and similar installations. Various models (with floor, wall, and recessed cabinets) are shown, special features are illustrated, piping connections are diagrammed and steam capacity and forced circulation hot water capacity tables are given.

Coordinate Graph Paper

HPAC 111—Orbit Electric Co., 2710 N. Menard Ave., Chicago 39—Bulletin 1237 explains the use of "Arktan" arctangent coordinate graph paper for curve plotting in scientific, mathematical, engineering and statistical analysis. It includes samples of two types of paper — one with one arctangent scale and one linear scale, and the other with double arctangent coordinates.

Copper Industry

HPAC 112—Revere Copper and Brass, Inc., 230 Park Ave., New York 17—50 page booklet, *Paul Revere, Industrialist,* traces the importance of Revere's role in founding the copper industry in America, and the role of his descendants in carrying it forward. Also described are some of the facilities and some of the products of the company today.

Dampers and Damper Controls

HPAC 113—The Young Regulator Co., 5209 Euclid Ave., Cleveland 3—Catalog 51 treats damper regulators (remote control, air split, concealed and flush cup, etc.), dampers (fresh air, relief, etc.), damper accessories, grilles, remote controlled registers, and other equipment such as expansion joints and unions.

Differential Converter

HPAC 114—Minneapolis-Honeywell Regulator Co., Industrial Div., Station 40, Philadelphia 44—Catalog 2281 gives operating principles, construction features, typical applications, specifications and installation methods for a new mercuryless, pneumatic balance type of flow transmitter with continuous range change adjustment from 0-20 to 0-200 in. of water.

Fig. 3650 Close-Cupled Centrifugal

Trouble-Free Operation makes Air Conditioning Customers Your Best Salesmen

If there's anything that pleases your air conditioning customer —and makes you happy too—it's the smooth operation of the unit—without breakdown or repair. An air conditioning installation that's trouble-free turns that customer into one of your star salesmen.

Goulds pumps are famous for trouble-free service—and there is good reason for this. Goulds give you the most careful engineering, top-grade materials, and skilled workmanship—a pump that will give long years of perfect service. Goulds Close-Cupld pumps in your installation mean more satisfied customers. For larger jobs Goulds Double-Suction Centrifugals are equally dependable.

Call or write Pump Headquarters for complete information.

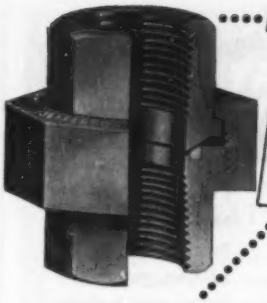
Goulds PUMPS INC.
Seneca Falls
New York

AUTOMATIC CONTROL
for product or process

GENERAL CONTROLS
801 ALLEN AVENUE GLENDALE 1, CALIFORNIA

Manufacturers of Automatic Pressure, Temperature, Level and Flow Controls

FACTORY BRANCHES: Baltimore 5, Birmingham 3, Boston 16, Buffalo 3, Chicago 5, Cincinnati 2, Cleveland 15, Dallas 2, Denver 4, Detroit 21, Glendale 1, Houston 6, Indianapolis 4, Kansas City 2, Minneapolis 2, Newark 6, New York 17, Philadelphia 23, Pittsburgh 22, St. Louis 3, San Francisco 7, Seattle 1, Tulsa 6, Washington 6.
DISTRIBUTORS IN PRINCIPAL CITIES



....here's how to....

Save Space in Tight Spots

JEFFERSON SPECIALTY UNIONS

Close fits are simple with Jefferson Unions . . . and once in they'll STAY in because we make them from a very fine malleable iron with a tensile strength of 55,000 lbs per sq in. Details such as the machining instead of casting the ring channels . . . making the rings from special tubing instead of casting them and testing all fittings with air before delivery all add up to a minimum of maintenance after the installation. You're sure the job's in to stay when the joints are made with Jefferson Specialty Unions.

Please write today . . .

JEFFERSON UNION CO.
607 West 26th Street, New York 1, N. Y.
35 Fletcher Avenue 65 Gooding Street
Lexington 73, Mass. Lockport, N. Y.

1 heater or 100

Easily, Quickly Installed

Reznor Dealers are backed with about 116 million ad impressions annually. A top name and quality product with models for the small single room and capacity (with multiple installations) for the largest. Homes, offices, stores and factories are users. Potential of the market unlimited. Write for proposition.

REZNOR MANUFACTURING CO.
31 UNION ST. · MERCER, PENNA.

Send me 20-page catalog in full color

Name_____
Firm_____
Address_____
City_____ Zone____ State_____

Fuel shortages or failures always pick the very worst time to occur SIEMON COMBI-MATIC Oil and Gas Burners will increase sales for you by eliminating many headaches for both you and your customers and assuring dependable, completely automatic, economical heat. Write today for complete information about this amazing new burner.

SIEMON & CO. 1819 HOLMES KANSAS CITY, MO.

For boilers operating at pressures up to 200 lbs.

Operating records show the Johnson System can often save its own cost in less than a year. Our nationwide engineering organization is ready to survey your needs without obligation.

Write for new 12-page catalog.

The Johnson Corporation

806 Wood St., Three Rivers, Mich.

Electric Hammer and Drill

HPAC 115—Wodack Electric Tool Corp., 4627 W. Huron St., Chicago 44—Bulletin 510 describes the "Do-All" electric hammer and drill for drilling concrete and masonry, for calking, flue beading, cutting metal sheets, buffing, wire brushing, etc.

Fans and Blowers

HPAC 116—Chelsea Fan & Blower Co., Inc., 639 South Ave., Plainfield, N. J.—Catalog covers window, industrial, pressure, and duct booster fans; automatic louvers; and blowers (stationary and portable). It includes an industrial ventilation guide which discusses fan selection, recommended air changes, calculation of resistance, etc.

Heat Transfer Equipment

HPAC 117—Kramer Trenton Co., N. Olden & Bruening Aves., Trenton 5, N. J. — a 52 page catalog, No. R-225, includes illustrations of all the company's products. Covered are unit coolers of various types, air conditioning units, condensers, cooling towers, heat interchangers, water cooling evaporators, baffles, coils and other equipment.

Industrial Fluid Heating Units

HPAC 118—General Fittings Co., 118 Georgia Ave., Providence 5, R.I.—Catalog 60 features instantaneous water heaters, converters, fuel oil heaters (baffle type), indirect U type water heaters, live steam water heaters, tank heating units, and coil heated tanks. Typical installations are shown and sizing data and steam consumption tables are given.

Magnetic Drives

HPAC 119—Electric Machinery Mfg. Co., 1331 Tyler St., N.E., Minneapolis 13 — Publication 1107 contains information on the company's adjustable speed magnetic drives and the new magnetic amplifier "Regutron" speed control. A special section is devoted to applications (for combustion control, pumps, etc.).

Metal Framing for Piping Support, Mechanical and Electrical Equipment

HPAC 120—Unistrut Products Co., 1013 W. Washington Blvd., Chicago 7—Catalog 700 outlines methods for using metal framing to frame, hang, mount and support many kinds of mechanical and electrical equipment. Included are applications of pipe hangers and clamps, pipe roller supports, spring tubing clamps, etc.

Metering Orifices

HPAC 121—Warren Webster & Co., 1664 Federal St., Camden 5, N.J.—Bulletin B-161 describes metering orifices (cup, push seat, valve nipple, pipe nipple, pipe nipple extension, tube type, bent tube type, long length tube, manifold coil, and intermediate) for use with the "Moderator" system of steam heating.

AIR-FLO

AUTOMATIC

CEILING SHUTTER

FOR ATTIC FAN

Built so they can be installed practically flush with the ceiling, AIR-FLO Ceiling Shutters present a refined, finished appearance. Their natural aluminum color blends with any decoration, eliminating need for painting, and no grille or winter cover is required. Furnished in 5 different widths, single panel up to 72" long. No operating mechanism shows. Built-in fusible link. Meets fire underwriters requirements.

WRITE FOR NEW CATALOG 43-C

Illustrations and details of the complete AIR-FLO line.

AIR CONDITIONING PRODUCTS CO.

2340 W. LAFAYETTE BLVD. · DETROIT 16, MICH.

NEW TYPE CI

ADJUSTABLE THERMOSTAT

The new Type CI Adjustable Indicating Thermostat is a precise temperature control for gas, liquid, and metal-to-metal applications, such as ovens, hot plate presses, water baths, incubators, proofing cabinets and cold cabinets. It is most useful on units where periodic checks of temperature are required, advisable, or will prove time-saving. The new Type CI is simply and ruggedly built, employing the highly sensitive response action of a solidly liquid-filled bulb and bellows assembly to a snap-acting switch and indicating pointer. The thermostat is adjustable over its entire range by a knurled thumbscrew on the front of the case.

SPECIFICATIONS:

Case 5½ x 5½ x 1¾", Wt. 3 lbs. Standard ranges 50° – 350°F and 50° – 600°F, special ranges may be had between –120°F and +600°F. Standard differentials ½°F in circulating liquid, 2°F in air. Switch ratings 10 amp 125 V AC and 5 amp 250 V AC. Write for new bulletin No. 4816T which gives full details.

UNITED ELECTRIC CONTROLS COMPANY

87 School Street

Watertown, Mass.

STANDARD & SPECIAL THERMOSTATS & PRESSURE SWITCHES

33 EASTERN SEABOARD BRANCHES

BRINGING 33,000 PRODUCTS OF OVER 1900 MANUFACTURERS IN ONE DELIVERY

HAJOCA CORPORATION

Manufacturers and Distributors of Plumbing, Heating, Industrial and Refrigeration Supplies and Equipment

See Your Telephone Directory for Branch Locations

GENERAL OFFICES: 31st & WALNUT STS., PHILADELPHIA 4, PA.

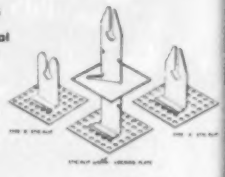
For COLD STORAGE

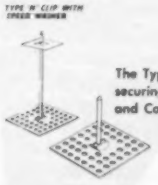
Insulation Installations

Stic-Klip provides ---

Stic-Klips Types A and B

For securing Fiberglas and Mineral Wool boards in single or multiple layer applications.





The Type "N" Stic Klips for securing dense Mineral Wool Felts and Cork Board Insulations.

Type S Adhesive.
A Neoprene Base, High Strength Quick Setting, Fire Retardant, durable adhesive.

Bulletins & Pamphlets Available On Request.

Stic-Klip MANUFACTURING CO.
50 Regent St. Cambridge 40, Mass.

MINERALLAC
Perforated
STRAP
Versatile Hanger Iron

Safely supports hanging pipes, conduits and cables up to 500 lbs. Made of ¾-in. 18 gauge electro-galvanized steel (also available in Everdur, copper, brass or aluminum). Precision made—perforations do not vary. ¼-in. holes on ½-in. centers. Comes in 10-ft. coils and 5 and 10-ft. straight lengths. Available in other lengths also.

Send for literature and prices

Specify
MINERALLAC

HANGERS, CLIPS, STRAPS, BUSHINGS
MINERALLAC ELECTRIC COMPANY
23 North Peoria Street
Chicago 7, Illinois

MINERALLAC

NEW condensate return unit has wide application!

- Two sizes cover range up to 8000 sq. ft. EDR at 20 psi
- Handles water at 210 F. without vapor lock
- Minimum floor space required
- Single phase or 3-phase, 1750 rpm motors
- For use where piping is close to floor level, may be installed in shallow pit

The new Roth Condensate Return Unit is a small vertical unit designed to meet a wide variety of applications. Receivers (10 or 15 gallon) supplied in choice of cast iron or steel. Simplex and duplex units available. Fine quality and construction meet the most exacting requirements.

See your nearest distributor or write direct today. Ask for Bulletin No. 212.

ROY E. ROTH CO.
2420-J 4TH AVE.
ROCK ISLAND, ILL.

ROTH PUMPS

Motor Starters

HPAC 122—Industrial Control Div., The Arrow-Hart & Hegeman Electric Co., 103 Hawthorn St., Hartford 6, Conn.—Eight page folder gives complete information, including dimensions, weights, ratings and wiring diagrams, for a new line of "Explo-Safe" weatherproof, lightweight, magnetic across-the-line motor starters.

Nickel Alloyed Cast Iron

HPAC 123—The International Nickel Co., Inc., 67 Wall St., New York 5 — 28 page bulletin, *Guide to the Selection of Engineering Irons,* presents the characteristics (endurance limit and notch sensitivity, damping capacity, hardness, etc.) and industrial uses of nickel cast irons.

Nickel and Nickel Alloy Pipe and Tubing

HPAC 124—The International Nickel Co., Inc., Development and Research Div., 67 Wall St., New York 5—Technical bulletin T-17 discusses the fabrication and design of nickel and high-nickel alloy pipe and tubing. Tables give data on mechanical and physical properties, ASME code requirements, recommended welding procedures, etc.

Nylon Balls for Valves, Bearings, etc.

HPAC 125—Ace Plastic Co., Industrial Div., 91-30 Van Wyck Blvd., Jamaica 2, N.Y.—Bulletin NP-101 gives complete information on nylon balls for valves, valve components, anti-friction bearings, detents, mechanical checks, etc.

Packaged Electrical Systems

HPAC 126—General Electric Co., Schenectady 5, N.Y.—24 page bulletin, No. GEA-5600, discusses the use of packaged electric power for rapid industrial expansion requiring a minimum of critical materials.

Packaged Steam Generators

HPAC 127—York-Shipley, Inc., York, Pa.—Bulletin ID-51-115 discusses and illustrates the advantages and special features of the "Steam-Pak" packaged generator, for steam heating, hot water heating, or process requirements from 15 hp and up. Various parts, such as the forced draft blower, the combustion chamber, the target ring, the metering oil pump and the iris shutter are described.

Pipefitting Tools, Threading Machines, and Other Equipment

HPAC 128—The Capewell Mfg. Co., Hartford 2, Conn.—Catalog and price book covers a complete line of hand and power hack saw blades, metal and wood cutting band saws, band knives, pipefitters' hand tools, pipe and bolt threading machines, hammers, ground flat stock, foundry nails and horse nails.

Pressure Snubber

HPAC 129—The Chemiquip Co., 6-8 E. 97th St., New York 29—Illustrated data sheet lists ratings, specifications, etc., and describes applications of the "Micro Metallic" pressure snubber (in ¼ and ½ npt) which is designed to give average pressure readings, smooth out pressure fluctuations and remove solids from actuation fluid.

How to promote greater PER-MAN productivity!

Well-ventilated working environments contribute to faster, better defense production.

Western Rotary Turbine Ventilators provide constant, round-the-clock exhaust *without power*. A 2-mph breeze keeps your Western Rotary System in operation. Lifetime guaranteed bearings are both mounted on the same axis . . . always stay in alignment. Throat sizes 6" through 48", with the clean, low silhouette progressive industry demands.

Complete, up-to-the-minute information, sizes, capacities, and prices on all Western equipment upon request. In 1951 SWEETS and A. E. C. **AVAILABLE FROM YOUR FAVORITE WHOLESALER'S STOCK.**

"ALWAYS ON THE JOB — NEVER ON THE PAYROLL"

WESTERN ENGINEERING & MFG. CO.
1726-28 E. WASHINGTON BLVD., LOS ANGELES 21, CALIF.

AGITAIR® METER

For Accurate Measurement of Air Velocity and Air Pressure

Low Velocity Range: 0-750 fpm
High Velocity Range: 750-4000 fpm
Pressure Range: 0-4 inches water

Based on the hot thermopile principle, the AGITAIR Meter gives instantaneous accurate measurements of air velocities as low as 5 fpm, and as high as 4000 fpm. It is inherently stable, does not waver or jerk and unlike many resistance type hot-wire instruments it is free from errors caused by temperature variations, radiation effects and lead resistance. For taking static pressure readings from 0 to 4" wg, a special attachment is provided. The simplicity and utility of the AGITAIR Meter make it useful for many diverse applications.

Write for Bulletin AM-100

AIR DEVICES Inc.
17 East 42nd Street New York 17, N. Y.
Air Diffusers • Air Filters • Exhausters

...here are the reasons why

Grant Wilson
DUX-SULATION
ASBESTOS PROTECTED

is BEST FOR DUCT INSULATION

1. High thermal and acoustical insulating properties . . . K factor of .27 BTU and sound absorption approximately 61%. Integral, woven asbestos membrane.
2. Easy to handle, easy to install *correctly*, can't be crushed or cracked, springs back to original thickness if compressed. Supplied with special glue and tape, no "fasteners" needed.
3. Constant insulating values. Can't "powder", shift or sift; no thin spots, even at corners. No deterioration of any kind, no change of any kind.
4. Perfect adhesion, flexible, conforms to uneven surfaces. Can be installed in the shop and still withstand all necessary handling. Specifically engineered for duct application ONLY!

Inspect Dux-Sulation yourself!

Write Grant Wilson, Inc. 141 West Jackson Blvd., Dept. D Chicago 4, Illinois.

Grant Wilson inc.

IN NEW YORK CITY: Air Conditioning Utilities Co., 8 West 40th Street, New York 18, N. Y., LOngacre 3-4280.
IN CANADA: Atlas Asbestos Co., Ltd., Montreal, Toronto, Winnipeg, Vancouver.

ONLY A FEW CHOICE EXCLUSIVE TERRITORIES STILL OPEN!

DEALERS — MANUFACTURERS' AGENTS: Write for information on this

FAST SELLING LINE OF
Reinhard **GAS CONVERSION BURNERS!**

Reinhard Burners are built for converting practically every type of furnace, stove or range. A complete line of domestic, industrial and commercial gas conversion burners. Write today for complete information.

MANUFACTURED SINCE 1922

The House of Reinhard
11 So. Ninth St. Minneapolis, Minn.
Better Burners Are Made — Reinhards Make Them

FOR COMFORT OR PROCESS HEATING

Providing consistent, dependable hot air for space or process heating is simple when you use Chromalox Electric Heaters. Ready-to-use units are available for permanent or portable mounting; or you can build banks of heaters for specialized uses in air ducts, heat exchangers, ovens and other applications. Economical around-the-clock service with minimum maintenance; rapidly reached, accurately controlled temperatures; wide selection to meet specific needs.

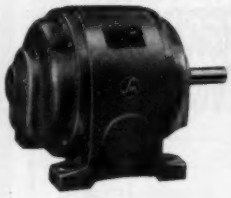
FOR MORE KNOW-HOW
Write for Catalog 50 which shows Chromalox Electric Heaters for use in offices, plants and homes.
50-28

EDWIN L. WIEGAND CO., 7610 THOMAS BLVD., PITTSBURGH 8, PA.

CHROMALOX

ELECTRIC HEAT FOR MODERN INDUSTRY

...quiet power



through modern engineering design

STERLING KLOSD MOTORS

Features . . .

...quiet operation—protected construction — streamlined design — cool running — through ventilation — double shielded ball bearings lubricated for life — NEMA dimensions — crossline starting — liberal connection space—dual voltage — vinol acetal insulated wire in stator windings — molecular welded connections. Available with feet or footless, face or flange mounted, drip-proof or splash-proof.

Write for bulletin No. FQ-61.

STERLING ELECTRIC MOTORS

Plants: New York 51, N. Y.; Los Angeles 22, California; Hamilton, Canada; Santiago, Chile. Offices and distributors in all principal cities.

Squirrel-Cage Induction Motors

HPAC 130—Allis-Chalmers Mfg. Co., 1171 S. 70th St., Milwaukee—Bulletin 05B7542A illustrates the construction features of large end-shield bearing squirrel cage induction motors in ratings up to 1750 hp at 1800 rpm.

Stainless Steel Welded Tubing

HPAC 131—Pypon Co., 410 Frick Bldg., Pittsburgh 22—Folder presents a number of different sizes and types, (different finishes, perforations, etc.) in stainless steel welded tubing. A table lists the sizes now available from the company.

Steam Trap Selection

HPAC 132—Yarnall-Waring Co., Mermaid Lane, Philadelphia 18—Bulletin T-1750, a trap selector supplement to the previously issued steam trap bulletin, lists alphabetically common process and industrial equipment and gives trap selection tables for each type, showing appropriate trap capacities for normal operating conditions.

Steel Tubing for Process Industries

HPAC 133—The Babcock & Wilcox Tube Co., Beaver Falls, Pa.—Illustrated bulletin, TA 1559, contains technical data on 20 carbon, alloy and stainless steels used for tubing in the petroleum, chemical, pulp and paper, food and pharmaceutical processing industries.

Stock Roller Chains and Sprockets

HPAC 134—Morse Chain Co., 7601 Central Ave., Detroit 8—Catalog C 55-50 gives details on list prices, on available sizes of three types of stock sprockets, and on stock roller chains from $\frac{3}{8}$ in. to 2 in. pitch. Data is included on drive selection, service factors, installation, and servicing.

Stokers for Burning Refuse or Coal

HPAC 135—Detroit Stoker Co., General Motors Bldg., Detroit 2—Booklet 505 describes and illustrates the "Rotostoker," a spreader stoker with stationary, hand dumping, or power dumping grates, which is used for burning refuse or coal separately or in combination. Photographs and diagrams illustrate various stoker installations such as for dry wood refuse and coal, wet wood refuse with and without coal, etc.

Valves and Fittings for Ammonia and "Freon 12"

HPAC 136—Frick Co., Waynesboro, Pa.—Catalog 0 (40 pages) gives information on ammonia and "Freon" valves and fittings, covering globe, angle, tee, expansion, check and seal-cap valves; elbows; tees; crosses; flanges; bolts and nuts; gaskets, etc. Tables offer a comparison of Reaumur, Centrigrade and Fahrenheit temperatures; lists of storage temperatures; and data on the properties of brines, the dimensions of steel and copper tubes, and the properties of refrigerants.

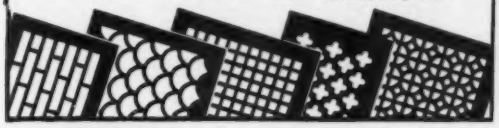
Welding of Nickel and High Nickel Alloys

HPAC 137—The International Nickel Co., Inc., Development and Research Div., 67 Wall St., New York 5—Technical bulletin T-33 offers information on the resistance welding of nickel and high nickel alloys. Tables give mechanical properties, chemical compositions, etc., which are recommended for welding.

Auer GRILLES

Stamped metal grilles in many designs, sizes to order, for all purposes—air conditioning, ventilating, radiator enclosure, or concealment. In steel (or stainless), aluminum, brass, or bronze. Finished in prime, or special finishes or platings. Catalog "G" shows all designs, with dimensions, opening sizes, full scale details. Sent on request.

THE AUER REGISTER COMPANY 6600 Clement Avenue Cleveland 5, Ohio



HANDY TUBE BENDER

FOR BENDING ALL TYPES OF TUBING AND PIPE

PORTABLE— IN SIZES TO BEND ⅜" O. D. TO 1⅛" O. D.

BENDS TO DESIRED SHAPE WITHOUT KINKS OR FLATS

AT LEADING SUPPLY HOUSES

HOLSCLAW BROS., INC.
408 Willow Road - Evansville, Indiana

Stedco

HIGH CAPACITY **RADIATION**
FOR
RESIDENTIAL
COMMERCIAL
INDUSTRIAL
Installation

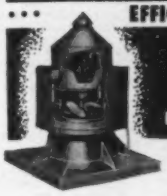
COMPACT **CONVECTORS**

Steel or Aluminum Fins

Stedco Products

Kingston, Penna.
Wilkes Barre, Penna.

...



EFFICIENT, LOW COST AIR REMOVER

Muckle VENTS
POWER DRIVEN ROOF EXHAUSTER

For stores, cafes, bakeries, laundries, garages, etc. Built to function in wet air—motor is out of line of air flow. A compact, sturdy, easy-to-install package unit. Sizes 370 to 13,080 C.F.M. air delivery. Fits any roof. *Write us about YOUR problem.*

MUCKLE MANUFACTURING CO. • OWATONNA 8, MINN.

CLASSIFIED

Rates are 12 cents for each word. One inch $6.00. Count nine words for keyed address. Minimum $2.00 for each insertion. Send remittance to HEATING PIPING & AIR CONDITIONING, 6 No. Michigan Ave., Chicago 2.

agent wanted

Manufacturers agent for metropolitan Chicago area now calling on Engineers, Contractors and Owners for the sale of Blast Coil Heating and Cooling Surface. Write John J. Nesbitt, Inc., Philadelphia 36, Pa., giving complete details of present activities.

for sale

PIPE FOR SALE — Approximately 7000 ft. 2" steel pipe.

Approximately 5080 ft. 1¼" Black Wrought Iron Extra Heavy Pipe.

This is used pipe in excellent condition.

THE KLAGES COAL & ICE COMPANY
551 South High Street
Akron, Ohio

FOR SALE — NEW — 108" Diameter by 312" Long Horizontal Storage Water Heater with steel shell ¾" thick and bumped heads ⅞" thick, welded construction. Storage capacity 11,900 gallons. Heating capacity 6000 gals. of water per hour from 40° to 180° F. with steam at 100# pressure. Total weight approximately 16 ton. Never been in use. Available for immediate shipment. Address Key 911-A, Heating, Piping & Air Conditioning, 6 No. Michigan Ave., Chicago 2.

One Boiler Installation — New. Rated 8800 feet of Steam Radiation — 7⅞ H.P. Meets A.S.M.E. Standards. Complete with Ace Heavy Oil Burner and all controls. Adequate to heat 60,000 sq. feet. WILL SACRIFICE FOR QUICK SALE.
Hance Brothers & White Co., 12th & Hamilton Sts., Philadelphia 23, Pa. REgemont 7-6700

lines wanted

MANUFACTURERS REPRESENTATIVE calling on Contractors, Dealers and Distributors in the Heating, Ventilating and Air Conditioning field, would like additional items of recognized manufacture and acceptable to Engineers and Architects. Interested in Steam Specialties, Controls, Convector, Baseboard and Fin Tube Radiation, Grilles, Registers, Filters, Unit Ventilators and allied equipment in the Steam and Hot Water Field. Will give complete coverage in N. Indiana, S. Michigan and W. Ohio. Write Key 914-A, Heating, Piping & Air Conditioning, 6 No. Michigan Ave., Chicago 2.

situations open

Sales Engineer for Chicago and vicinity to sell heating, ventilating and air conditioning equipment to commercial and industrial markets. Preference will be given to Graduate Engineer having experience in this field contacting architects and engineers. Personal interview will be arranged after receipt of written application giving full details of experience, personal data and salary required. Address Key 908-A, Heating, Piping & Air Conditioning, 6 No. Michigan Ave., Chicago 2.

situations open

MAJOR AIR CONDITIONING AND REFRIGERATION MANUFACTURER, in New England, needs DESIGN ENGINEERS with three to ten years experience — to conduct research, development and production engineering work on open and hermetic compressors, central-plant air conditioners, room coolers, product coolers, and refrigerant and water coils of all types. Write Key 909-A, Heating, Piping & Air Conditioning, 6 No. Michigan Ave., Chicago 2, describing education, training and experience, and giving business and personal references.

ENGINEER — AIR CONDITIONING
Permanent!
Must be thoroughly exp. in designing, estimating & supervising.
EXCELLENT OPPORTUNITY!!
Call or write all details in first reply.
COLD STREAM CONDITIONING CORPORATION
228 West Houston St., N. Y. — Oregon 5-2035

MECHANICAL Engineer for product development with long established Philadelphia Manufacturer of heating, ventilating and air conditioning equipment. Applicant must be engineering graduate, age 32 to 40 and must have a good development background in this or allied field. Position requires a man of creative ability and one who can direct the activities of other engineers in product development. Excellent opportunity in a firm of moderate size which is growing steadily. Salary open. Address K-56, P.O. Box 5552, Philadelphia 22, Pa.

agents wanted

Manufacturer's representatives wanted for complete line of gas unit heaters and garbage disposal units. Applications considered only from agents with well-established following among heating & plumbing jobbers. All products nationally advertised. Commission basis, exclusive territories. Submit detailed application in first letter, including references. Address Key 910-A, Heating, Piping & Air Conditioning, 6 No. Michigan Ave., Chicago 2.

INDEX TO ADVERTISERS

A-J Mfg. Co. 206
Acme Industries, Inc. 75
Aerofin Corp. ..... *
Air Conditioning Products Co. 225
Air Devices, Inc. 227
Air-Maze Corp. 205
Airtex Corporation ..... *
Airtherm Mfg. Co. 209
Alco Valve Co. 24
Aldrich Co. ..... *
Allen-Bradley Co. ..... *
Allis-Chalmers Mfg. Co. ..... 6 & 17 & 45
American Air Filter Co. 155
American Blower Corp. 35
American Brass Corp., The 37
American Chain & Cable Co., The ..... *
American Radiator & Standard Sanitary Corp. ..... *
American Wheelabrator & Equip. Corp. .. 208
Ames Iron Works ..... *
Anderson Co., V. D. 172
Anemostat Corp. of America ..... *
Armstrong Cork Co. 64
Armstrong Machine Works 215
Atlas Mfg. Co. ..... *
Auer Register Co. 229
Aurora Pump Co. ..... *
Autorad, Inc. ..... *

Babcock & Wilcox Co. ..... *
Bacharach Industrial Instrument Co. .. 210
Badger Manufacturing Co. 209
Baker Refrigeration Corp. ..... *
Barber-Colman Co. 53
Barnes & Jones, Inc. 221
Bayley Blower Co. ..... *
Bell & Gossett Co. ..... 26 & 185
Binks Mfg. Co. ..... *
Bishop & Babcock Mfg. Co., The 222
Black & Decker Mfg. Co. 219
Breidert Co., G. C. ..... *
Brunner Mfg. Co. 41
Bryant Heater ..... *
Buffalo Forge Co. 29
Buffalo Pumps, Inc. 47
Bullard Co., The 184
Bundy Tubing Co. 32
Burnham Corporation 187
Bush Mfg. Co. ..... *
Byers Co., A. M. 4

Campbell Heating Co. ..... *
Carey Co., Phillip, The ..... *
Carrier Corp. ..... 54 & 55
Cash Co., A. W. ..... *
Century Electric Co. 21
Chase Brass & Copper Co. 191
Chicago Blower Corp. ..... *
Chicago Pump Co. 150
Clarage Fan Co. ..... Inside Back Cover
Cleaver-Brooks Co. 7
Cleveland Fuel Equipment Co. ..... *
C-O-Two Fire Equipment Co. ..... *
Combustion Engineering—Superheater Inc. 164
Committee on Steel Pipe Research of American Iron & Steel Institute ... 183
Condenser Service & Engineering Co. ... 220
Connor Engr. Corp., W. B. ..... 61 & 73
Continental Air Filters, Inc. 186
Copeland Refrigeration Corp. ..... *
Correctair Div., Boyle-Midway, Inc. 18
Crane Co. 25
Crocker-Wheeler Div. Elliott Co. ..... *
Curtis Refrigerating Machine Co. 162
Cyclotherm Corp. 205

Davis Engineering Corp. ..... *
De Bothezat Fans Division American Machine & Metals, Inc. .. 193
De Laval Steam Turbine Co. ..... *
Delavan Mfg. Co. ..... *
Detroit Lubricator Company ..... *
Detroit Stoker Company ..... *
Dodge Mfg. Co. 37
Dole Refrigerating Co. ..... *
Dole Valve Co., The 177
Dollinger Corp. ..... *
Dravo Corporation 65
Dunham Co., C. A. ..... *
Durant Insulated Pipe Co. ..... *
Dwyer Mfg. Co., F. W. ..... *

Eagan Co., Inc., Walter H. ..... *
Economy Pumps, Inc. 176
Emerson Elec. Mfg. Co. 171

Fairbanks Co. ..... *
Farr Co. 179
Fedders-Quigan Corp. ..... *
Fisher Governor Co. ..... *
Fitzgibbons Boiler Co., Inc. ..... *
Fluid Systems ..... 42 & 43
Frick Co. ..... *
Fulton Sylphon Co. ..... *

G. & O. Mfg. Co., The ..... *
Gallaher Co. ..... *
General Controls Co. 223
General Electric Co. 71
General Fittings Co. 168
Glasfloss Corp., The ..... *
Goulds Pumps, Inc. 223
Governair Corp. 196
Greenlee Tool Co. ..... *
Grinnell Co., Inc. ..... Inside Front Cover
Gustin-Bacon Mfg. Co. 156

Hajoca Corporation 225
Hamilton-Thomas Corp. 176
Handy & Harman 175
Hapman-Dutton Co. ..... *
Hastings Instrument Co., Inc. ..... *
Hayes Furnace & Mfg. Co., Inc. ..... *
Hays Corp. ..... *
Hendrick Mfg. Co. 211
Henry Valve Co. 170
Hoffman Specialty Co. ..... *
Holoclaw Bros., Inc. 229
Howell Electric Motors Co. 34
Hussey & Co., C. G. 52

Ilg Electric Ventilating Co. 15
Illinois Engineering Co. ..... *
Illinois Testing Laboratories, Inc. 198
Independent Register Co. ..... *
Industrial Sound Control Inc. ..... *
Infra Insulation, Inc. 79
Ingersoll-Rand ..... *
Iron Fireman Mfg. Co. 173

Jackson & Church Co. ..... *
Jefferson Union Co., Inc. 223
Jenkins Bros. 188
Jenn Air Products Co. ..... *
Johns-Manville ..... 178 & 207
Johnson Co., S. T. ..... *
Johnson Corp. 224
Johnson Service Co. ..... *
Joy Mfg. Co. ..... *

Kaylo Div., Owens-Illinois Glass Co. 174
Keasbey & Mattison Co. 169
Kennard Corp. ..... *
Kennedy Valve Mfg. Co., The 167
Kewanee Boiler Corp. 36
Key Co. ..... *
Klipfel Valves, Inc. ..... *
Kritzer Radiant Coils, Inc. ..... *

Ladish Co. 181
Lee Corporation, The ..... *
Lefax ..... *
Leslie Co. ..... *
Lincoln Electric Co., The ..... *
Lunkenheimer Co., The 149
Lycoming Spencer Div., Avco Mfg. Corp. 153

Marley Co., The 161
Marlo Coil Co. 166
Marsh Heating Equipment Co. ..... *
McCord Corp. ..... *
McDonnell & Miller, Inc. ..... Outside Back Cover
McGraw-Hill Book Co., Inc. ..... *
McQuay, Inc. 11
Mercoid Corp., The ..... *
Mettler Co., Inc., The ..... *
Mid-Continent Metal Products Co. 219
Midwest Piping & Supply Co. 49
Minerallac Electric Co. 226
Minneapolis-Honeywell Regulator Co. ..... 194 & 195
Modine Mfg. Co. ..... 50 & 51
Muckle Mfg. Co. 229
Mueller Brass Co. 40
Mueller Furnace Co., L. J. ..... *
Multi-Vent Div., Pyle National Co. 8
Mund Boilers, Inc. 199
Mundet Cork Co. ..... *
Murray Mfg. Co., D. J. ..... *
Mystic Adhesive Products ..... *

Nash Engineering Co. 84
National Heater Co. ..... *
National Radiator Co., The 157
National Tube Co. ..... *
Nelson, Herman Div. of American Air Filter Co., Inc. ..... 200 & 201
Nesbitt, Inc., J. J. 80
New ork Blower Co., The ..... *
Niaga Blower Co. 213
Nicholson & Co., W. H. 220

Ohio Brass Co. ..... *
Ohio Injector Co. ..... *
Olson & Company, Arthur A. 163
Orr & Sembower, Inc. ..... *
OverHead Heaters, Inc. 48
Owens-Corning Fiberglas Corp. ..... *

Patterson-Kelley Co., Inc., The 72
Peerless Elec. Co. 213
Peerless Pump Div., Food Machinery & Chemical Corp. 33
Penn Electric Switch Co. ..... *
Perfex Corp. ..... *
Penn Ventilator Co. 216
Pittsburgh-Corning Corp. 158
Porter & Co., H. W. ..... *
Powers Regulator Co., The ..... 62 & 63
Prat-Daniel Corp. ..... *
Preferred Utilities Mfg. Co. 221
Pritchard Co., J. F. ..... *
Propellair, Inc. 207

R P & C Division American Chain & Cable Co., The ..... *
Ramset Fasteners, Inc. ..... *
Register & Grille Mfg. Co. ..... *
Reinhard Brothers Co. 227
Rempe Co. 222
Republic Steel Corp. 159
Research Products Corp. ..... *
Revere Copper & Brass, Inc. 83
Reznor Manufacturing Co. 223
Rhode Island Fittings Co. ..... *
Rhodes, Inc., M. H. ..... *
Ric-wil Co., The ..... *
Ridge Tool Co. 304
Rockwell Co., W. S. ..... *
Roth Co., Roy E. 226

SKF Industries, Inc. ..... *
Sarco Co., Inc. 58
Sarcotherm Controls, Inc. 59
Schaub Engineering Co., Fred H. 182
Sellers Engineering Co. ..... *
Servel, Inc. ..... 66 & 67
Siemon & Co. 224
Skidmore Pumps ..... *
Smith Co., Inc., H. B., The ..... 30 & 31
Spang-Chalfant Div. of The National Supply Co. 14
Spence Engineering Co., Inc. 76
Spencer Heater ..... *
Sporlan Valve Co. 19
Spraying Systems Co. ..... *
Standard Stamping & Perforating Co. ... 165
Steelco Products ..... *
Stephens-Adamson Mfg. Co. ..... *
Sterling, Inc. ..... *
Sterling Electric Motors 228
Stic-Klip Mfg. Co. 225
Sturtevant Co., B. F. ..... Div. of Westinghouse Elec. ..... 68 & 69
Sullivan Valve & Engrg. Co. 36
Superior Combustion Industries, Inc. ..... *
Surface Combustion Corp. 70
Swartwout Co. 217

Taco Heaters, Inc. ..... *
Taylor Forge & Pipe Works 57
Taylor Instrument Cos. 74
Thrash & Co., H. A. 22
Titus Mfg. Corp. 13
Titusville Iron Works Co., The, Div. of Struthers Wells Corp. 212
Trane Co., The 20
Tri-Clover Machine Co. ..... *
Tube Turns, Inc. ..... *
Tuttle & Bailey, Inc. 152
Typhoon Air Conditioning Co., Inc. ..... *

Union Asbestos & Rubber Co. ..... 202 & 203
Unistrut Products Corp. ..... *
United Cooling Tower Co. ..... *
United Electric Controls Co. 225
United States Air Conditioning Co. 3
United States Steel Co. 38
Utility Appliance Corp. ..... *

Velocity Power Tool Co. 211
Vilter Manufacturing Co., The 214
Vulcan Radiator Co. 154

Wagner Electric Corp. 12
Waldron Corp., John ..... *
Walton Laboratories ..... *
Walworth Co. ..... 44 & 217
Ward Leonard Elec. Co. 197
Watson-Stillman Co. 33
Webster & Co., Warren ..... 38 & 39
Webster Engineering Co., The 180
Weil Pump Co. 218
Welding Fittings Corp. 9
Western Engineering & Mfg. Co. 227
Wheatland Tube Co. ..... *
Wheeler Mfg. Co., C. H. ..... *
White-Rodgers Electric Co. ..... *
Whitlock Mfg. Co. ..... *
Wiegand Co., Edwin L. 228
Will-Burt Company, The ..... *
Willson & Co. ..... *
Wilson, Inc., Grant 227
Wing Mfg. Co., L. J. ..... 209 & 215
Wolverine Tube Div. of Calumet & Hecla Consolidated Copper Co. 60
Worthington Pump & Machinery Corp. ... 16

Yarnall-Waring Co. 10
Yates-American Machine Co. ..... *
York Corp. ..... *
York-Shipley ..... *
Young Radiator Co. ..... *
Youngstown Sheet & Tube Co. 46

Zallea Bros. ..... *

Firms represented in this issue are identified by the folio of the page on which their advertising appears. Advertising which appears in other issues is marked with an asterisk.

* 2,800,000 C.F.M. . . . 120 AIR CONDITIONING SYSTEMS . . . showing 5 of the 324 Clarage Fans delivering conditioned air to manufacturing areas.
UPJOHN

*Upjohn

installs

CLARAGE HEAVY-DUTY FAN EQUIPMENT

Fine Pharmaceuticals!...the making of over 700 different kinds has started in this great plant of the Upjohn Company, 10 minutes south of Kalamazoo.

Here much of the manufacturing...***to maintain integrity of product***...is dependent upon air conditioning. 120 complete systems handling 2,800,000 c.f.m. are installed.

A multimillion dollar project... Engineers and Builders, The Austin Company, Cleveland.

Upjohn has had more than a quarter-century of experience with Clarage Equipment. It well may be that this was the deciding factor in selecting Clarage ***HEAVY-DUTY*** Fans for ***every one*** of the air conditioning systems operating in this new Upjohn plant.

CLARAGE

—HEADQUARTERS for Air Handling and Conditioning Equipment

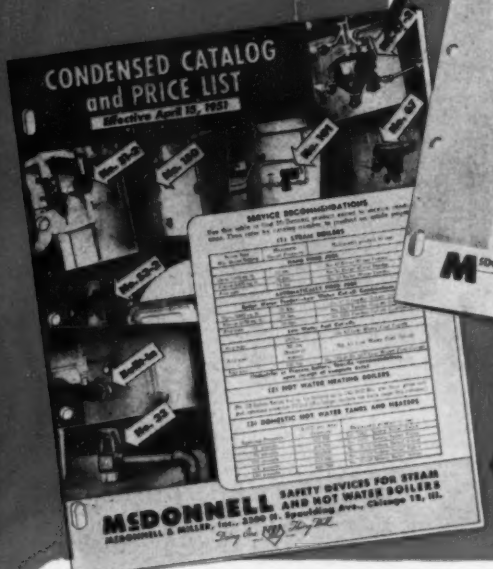
CLARAGE FAN COMPANY

KALAMAZOO, MICHIGAN

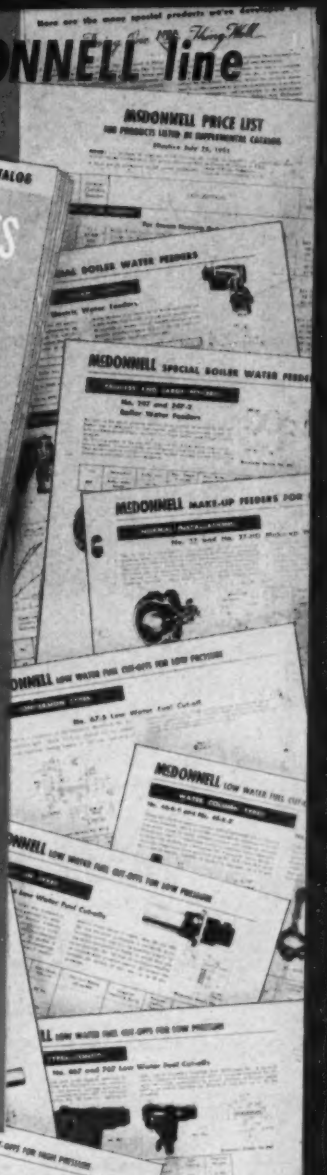
APPLICATION ENGINEERING OFFICES . . . . IN ALL PRINCIPAL CITIES

These TWO catalogs cover the McDONNELL line

The NEW McDonnell SUPPLEMENTAL CATALOG


CONDENSED CATALOG
and PRICE LIST
Effective April 15, 1951
SERVICE RECOMMENDATIONS
McDONNELL
SAFETY DEVICES FOR STEAM AND HOT WATER BOILERS
McDONNELL & MILLER, Inc., 3500 N. Spaulding Ave., Chicago 18, Ill.

THE McDONNELL CONDENSED CATALOG & PRICE LIST


McDONNELL PRICE LIST
McDONNELL SPECIAL BOILER WATER FEEDS
McDONNELL MAKE-UP FEEDERS FOR
McDONNELL LOW WATER FUEL CUT-OFFS FOR LOW PRESSURE

Chances are you are already familiar with the McDonnell Condensed Catalog. It covers in handy compact form the standard McDonnell Boiler Water Feeders, Low Water Fuel Cut-offs and Safety Relief Valves that answer the bulk of your requirements.

Supplementing it now comes a new 20-page catalog covering the more special McDonnell products, that extend the "Doing One Thing Well" idea to many operating requirements. As these sample pages show, the Supplemental Catalog includes important engineering information, capacity curves and dimensions. It represents the most complete storehouse of information on boiler feeders, cut-offs, float-operated switches and related products ever published.

With these two books you can go after profits on McDonnell equipment for every type of steam or hot water heating boiler, for domestic hot water tanks and heaters, and for many other liquid level or flow control jobs. Make sure you have *both* these catalogs on hand; use the coupon below to write for your copies.

McDONNELL & MILLER, *Inc.*, 3500 N. Spaulding Ave., Chicago 18, Ill.

Doing One Thing Well

McDONNELL

Boiler Water Level Controls

Write for these McDonnell catalogs today

McDonnell & Miller, Inc.
3500 N. Spaulding Ave., Chicago 18, Ill.
Send me a copy of your new Supplemental Catalog and the Condensed Catalog and Price List.

Name_____ Address_____

City_____ Zone_____ State_____